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INSTALLATION RESTORATION PROGRAM

PHASE I - RECORDS SEARCH

SHAW AFB, SOUTH CAROLINA

PREPARED FOR

UNITED STATES AIR FORCE
TACTICAL AIR COMMAND
Directorate of Engineering
and
Environmental Planning
Langley AFB, Virginia

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MAY 1983

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NOTICE

INSTALLATION RESTORATION PROGRAM
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Prepared For

UNITED STATES AIR FORCE
TACTICAL AIR COMMAND
Directorate of Engineering and Environmental Planning
Langley AFB, Virginia

May 1983

Prepared By

ENGINEERING-SCIENCE
57 Executive Park South, Suite 590
Atlanta, Georgia 30329
#26307

NOTICE

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57 EXECUTIVE PARK SOUTH, N.E., SUITE 590 • ATLANTA, GEORGIA 30329 • 404/325-0770

CABLE ADDRESS: ENGINSCI
TELEX: 54-2882

May 27, 1983

Mr. Gil Burnet
TAC/DEEV
Langley AFB, VA 23665

Dear Mr. Burnet:

Enclosed is the Engineering-Science, Inc. (ES) report entitled "Installation Restoration Program, Phase I - Records Search, Shaw AFB, South Carolina." This report has been prepared in accordance with Air Force Contract Number F33615-80-D-4001, 0037.

Presented in this report are introductory background information on the Installation Restoration Program; a description of the Shaw AFB installation and associated off-base facilities including past activities, mission and environmental setting; a review of industrial activities conducted at Shaw AFB; an inventory of major solid and hazardous waste from past activities; a review of past and present waste handling, treatment and disposal facilities; an evaluation of the pollution potential of waste disposal sites; and recommendations for the Installation Restoration Program, Phase II, Confirmation Study.

We appreciate the opportunity to work with you and the other Air Force personnel who contributed information to us for the completion of this assessment.

Very truly yours,

ENGINEERING-SCIENCE, INC.

Ernest J Schroeder

E. J. Schroeder, P.E.
Project Manager

Mark Spiegel

M. I. Spiegel
Project Scientist

EJS/MIS/lmr

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EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

The Department of Defense (DOD) has developed a program to identify and evaluate past hazardous material disposal sites on DOD property, to control the migration of hazardous contaminants, and to control hazards to health or welfare that may result from these past disposal operations. This program is called the Installation Restoration Program (IRP). The IRP has four phases consisting of Phase I, Initial Assessment/Records Search; Phase II, Confirmation; Phase III, Technology Base Development; and Phase IV, Operations. Engineering-Science (ES) was retained by the United States Air Force to conduct the Phase I, Initial Assessment/Records Search for Shaw AFB under Contract No. F33615-80-D-4001, 0037.

INSTALLATION DESCRIPTION

Shaw Air Force Base is located in Sumter County, South Carolina approximately seven miles west of the City of Sumter. The base is located in a semi-rural area with most neighboring areas either vacant, wooded or used for agricultural purposes. Some residential and commercial development has occurred on property adjacent to the base. The study area for this project included the main base comprised of 3,336 acres and four off-base areas which are under the jurisdiction of Shaw AFB. These areas are as follows:

Shaw TACAN Navigational Aid..................0.15 Acres (owned)
Shaw Middle Marker Annex.....................0.23 Acres (owned)
Poinsett Range..........................8,038.5 Acres (leased)
Wateree Recreational Annex.................23.5 Acres (leased)

Shaw AFB began as a basic flying school in 1941. In 1946, control of the base was transferred from the First Air Force to the Tactical Air Command (TAC), and then, in 1948, to the Continental Air Command. The base was reassigned to TAC in 1950 and has remained as such. Since the

arrival of the 363rd Tactical Reconnaissance Wing in 1951, the primary mission of the base has been to employ tactical reconnaissance and fighter forces capable of meeting all operational requirements worldwide, to maintain a state of combat readiness and to operate Shaw by providing facilities, personnel and material. In 1976, the 507th Tactical Air Control Center became a full wing, establishing Shaw as a two-wing base. Most recently, the 19th and 17th Tactical Fighter Squadrons have been activated at Shaw, both of which are F-16 flying squadrons.

ENVIRONMENTAL SETTING

The environmental setting data reviewed for this investigation indicate the following major points that are relevant to the evaluation of past hazardous waste management practices at Shaw Air Force Base:

- The mean annual precipitation is 45.8 inches and mean net precipitation is calculated to be three inches.
- Surface soils of the Shaw Air Force Base area are typically sandy, moderately permeable and possess shallow water levels (twenty feet or less).
- Tertiary and Quaternary sediments forming the shallow aquifer system are present at Shaw AFB, either exposed or very near ground surface. These deposits are considered to be components of an important local aquifer from which Shaw AFB obtains a part of its water supplies. The base is located within what is probably a recharge zone for the shallow aquifer.
- Little runoff leaves the study area; flooding is not known to be a serious problem. It is suspected that most rainfall becomes recharge to the shallow aquifer.
- The two major regional aquifers present in the study area are the Black Creek and Middendorf (Tuscaloosa) systems. It is not known if the Black Creek is separated from the shallow system. The Black Creek is known to be separated from the underlying Middendorf.
- Local ground-water resources are of generally good quality, however, local variations in quality are known to be caused by aquifer conditions.

- Base surface waters are of generally good quality.
- No threatened or endangered species have been observed within Shaw AFB boundaries.

METHODOLOGY

During the course of this project, interviews were conducted with base personnel (past and present) familiar with past waste disposal practices; file searches were performed for past hazardous waste activities; interviews were held with local, state and federal agencies; and field and helicopter reconnaissance inspections were conducted at past hazardous waste activity sites. Thirteen sites were identified as potentially containing hazardous contaminants resulting from past activities (Figure 1 and Figure 2). These sites have been assessed using a Hazard Assessment Rating Methodology (HARM) which takes into account factors such as site characteristics, waste characteristics, potential for contaminant migration and waste management practices. The details of the rating procedure are presented in Appendix G and the results of the assessment are given in Table 1. The rating system is designed to indicate the relative need for follow-on action.

FINDINGS AND CONCLUSIONS

The following conclusions have been developed based on the results of the project team's field inspection, review of base records and files and interviews with base personnel.

The area determined to have a high potential for environmental contamination is as follows:

- Fire Protection Training Area No. 1

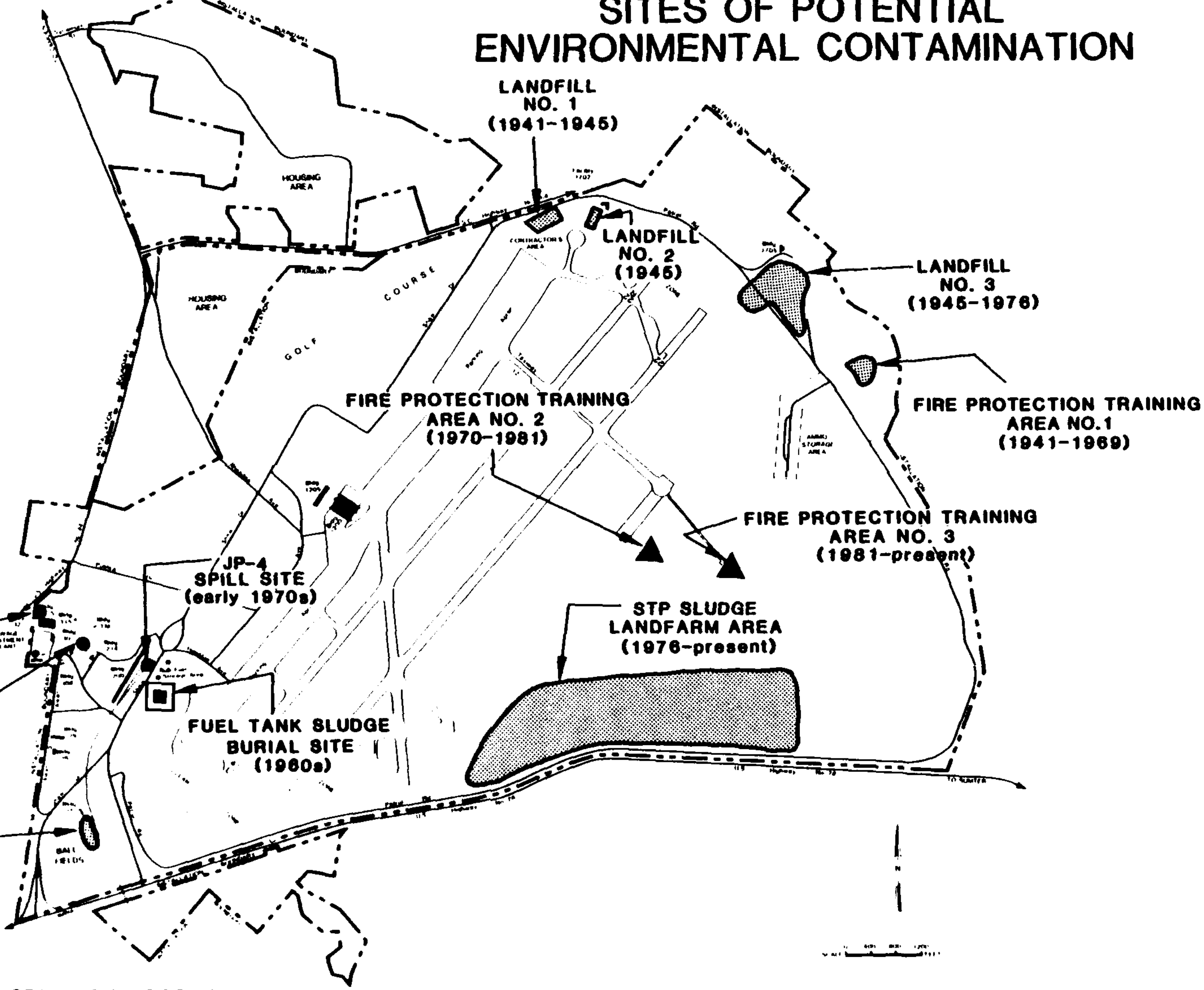
The areas determined to have a moderate potential for environmental contamination are as follows:

- CE Complex Storm Drainage Outfall
- Landfill No. 3

The areas determined to have a low potential for environmental contamination are as follows:

- JP-4 Spill Site
- Fuel Tank Sludge Burial Site
- Fire Protection Training Area No. 3

SHAW AFB
SITES OF POTENTIAL ENVIRONMENTAL CONTAMINATION



SOURCE: SHAW AFB INSTALLATION DOCUMENTS

FIGURE 1

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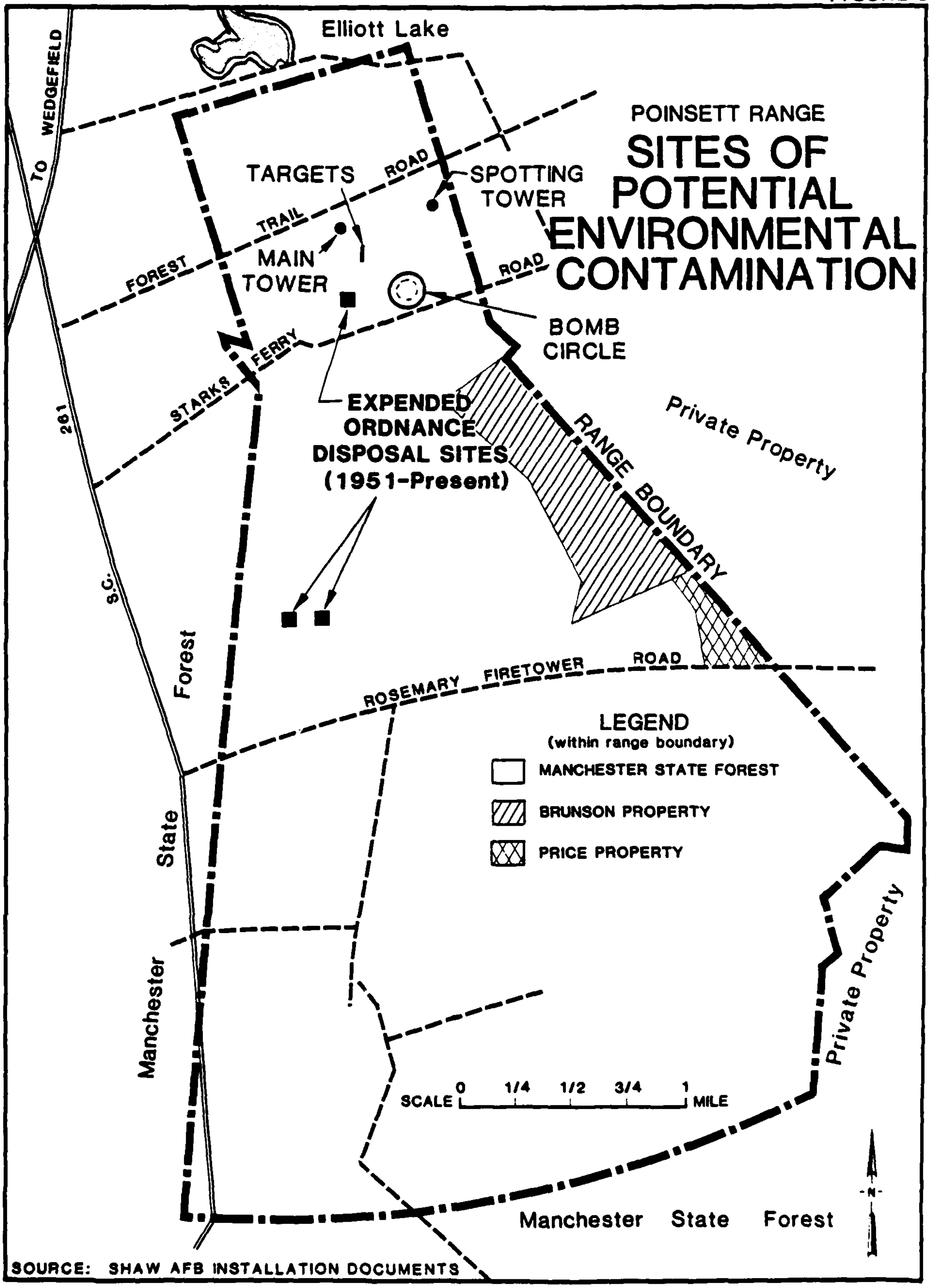
FIGURE 2



ES ENGINEERING - SCIENCE

TABLE 1

PRIORITY RANKING OF POTENTIAL CONTAMINATION SOURCES
SHAW AFB

Rank	Site Name	Date of Operation or Occurrence	Overall Total Score
1	Fire Protection Training Area No. 1	1941-1969	67
2	CE Complex Storm Drainage Outfall	1941-1980	60
3	Landfill No. 3	1945-1976	55
4	JP-4 Spill Site	Early 1970's	54
5	Fuel Tank Sludge Burial Site	1960's	53
6	Fire Protection Training Area No. 3	1981-present	50
7	Fire Protection Training Area No. 2	1970-1981	49
8	Landfill No. 2	1945	48
9	Landfill No. 1	1941-1945	47
10	Battery Acid Leak Site	Early 1970's	45
11	Inactive Coal Storage Area	1941-1969	43
12	Sewage Treatment Plant Sludge Landfarm	1976-present	42
13	Expended Ordnance Disposal Area	1951-present	40

NOTE: This ranking was performed according to the Hazard Assessment Rating Methodology (HARM) described in Appendix G. Individual site rating forms are in Appendix H.

- o Fire Protection Training Area No. 2
- o Landfill No. 2
- o Landfill No. 1
- o Battery Acid Leak Site
- o Inactive Coal Storage Area
- o Sewage Treatment Plant Sludge Landfarm
- o Expended Ordnance Disposal Area

RECOMMENDATIONS

Recommended guidelines for future land use restrictions at the thirteen sites identified in Table 1 are presented in Chapter 6. The detailed recommendations developed for further assessment of environmental concern areas at Shaw AFB are also presented in Chapter 6. These recommendations are summarized as follows:

o Fire Protection Training Area No. 1	Install monitoring wells and implement ground-water monitoring program
o CE Complex Storm Drainage Outfall	Surface water and sediment sampling
o Landfill No. 3	Install monitoring wells and implement ground-water monitoring program

CHAPTER 1

INTRODUCTION

CHAPTER 1

INTRODUCTION

BACKGROUND

The United States Air Force, due to its primary mission, has long been engaged in a wide variety of operations dealing with toxic and hazardous materials. Federal, state, and local governments have developed strict regulations to require that disposers identify the locations and contents of disposal sites and take action to eliminate the hazards in an environmentally responsible manner. The primary Federal legislation governing disposal of hazardous waste is the Resource Conservation and Recovery Act (RCRA) of 1976, as amended. Under Sections 3012 and 6003 of the Act, Federal agencies are directed to assist the Environmental Protection Agency (EPA) and state agencies to inventory past disposal sites and make the information available to the requesting agencies. To assure compliance with these hazardous waste regulations, DOD developed the Installation Restoration Program (IRP). The current DOD IRP policy is contained in Defense Environmental Quality Program Policy Memorandum (DEQPPM) 81-5, dated 11 December 1981 and implemented by Air Force message dated 21 January 1982. DEQPPM 81-5 reissued and amplified all previous directives and memoranda on the Installation Restoration Program. DOD policy is to identify and fully evaluate suspected problems associated with past hazardous contamination, and to control hazards to health and welfare that resulted from these past operations. The IRP will be the basis for response actions on Air Force installations under the provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, and clarified by Executive Order 12316.

PURPOSE AND SCOPE OF THE ASSESSMENT

The Installation Restoration Program has been developed as a four-phased program as follows:

Phase I - Initial Assessment/Records Search

Phase II - Confirmation

Phase III - Technology Base Development

Phase IV - Operations (Control Measures)

Engineering-Science (ES) was retained by the United States Air Force to conduct the Phase I Records Search at Shaw Air Force Base under Contract No. F33615-80-D-4001, 0037. This report contains a summary and an evaluation of the information collected during Phase I of the IRP. The land areas included as part of the Shaw AFB study are as follows:

Main base site	3336 acres (owned)
Tacan Navigational Aid	0.15 acre (owned)
Middle Marker Annex	0.23 acre (owned)
Poinsett Range	8038 acres (leased)
Wateree Recreation Annex	23.5 acres (leased)

The goal of the first phase of the program was to identify the potential for environmental contamination from past waste disposal practices at Shaw AFB, and to assess the potential for contaminant migration. The activities that were performed in the Phase I study included the following:

- Reviewed site records
- Interviewed personnel familiar with past generation and disposal activities
- Inventoried wastes
- Determined quantities and locations of current and past hazardous waste storage, treatment and disposal
- Defined the environmental setting at the base
- Reviewed past disposal practices and methods
- Conducted field and aerial inspection
- Gathered pertinent information from Federal, state and local agencies
- Assessed potential for contaminant migration.

ES performed the on-site portion of the records search during January 1983. The following core team of professionals were involved:

- J. R. Absalon, Hydrogeologist, BS Geology, 8 years of professional experience

- R. J. Reimer, Chemical Engineer, MSChE, 3 years of professional experience
- E. J. Schroeder, Environmental Engineer and Project Manager, MSCE, 16 years of professional experience
- M. I. Spiegel, Environmental Scientist, BS Environmental Science, 5 years of professional experience.

More detailed information on these individuals is presented in Appendix A.

METHODOLOGY

The methodology utilized in the Shaw AFB Records Search began with a review of past and present industrial operations conducted at the base. Information was obtained from available records such as shop files and real property files, as well as interviews with 69 past and present base employees from the various operating areas. Those interviewed included current and past personnel associated with the Civil Engineering Squadron, Bioenvironmental Engineering Services, Aircraft Generation Squadron, Equipment Maintenance Squadron, Fuels Management Branch and Explosive Ordnance Disposal. Experienced personnel from past tenant organizations were also interviewed. A listing of Air Force interviewees by position and approximate period of service is presented in Appendix B.

Concurrent with the base interviews, the applicable Federal, state and local agencies were contacted for pertinent base related environmental data. The six agencies contacted and interviewed are listed below as well as in Appendix B.

- o U.S. Department of Agriculture, Soil Conservation Service
- o South Carolina Water Resources Commission
- o South Carolina Department of Health and Environmental Control, Main Office in Columbia
- o South Carolina Department of Health and Environmental Control, District Office in Sumter
- o U.S. Geological Survey, Water Resources Division
- o U.S. Environmental Protection Agency, Region IV

The next step in the activity review was to determine the past management practices regarding the use, storage, treatment, and disposal

of hazardous materials from the various operations on the base. Included in this part of the activities review was the identification of all known past disposal sites and other possible sources of contamination such as spill areas.

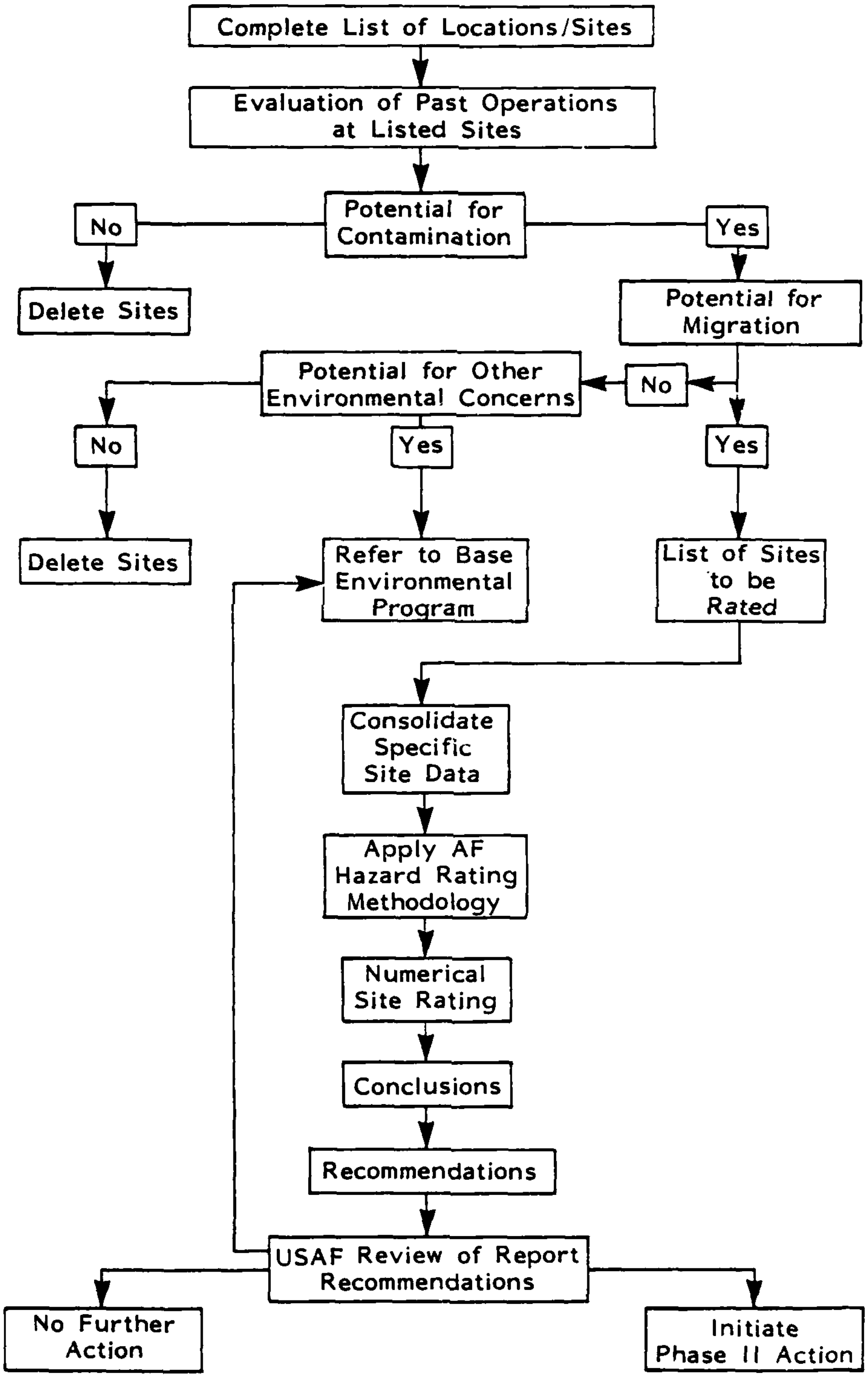
A general ground tour and a helicopter overflight of the identified sites were then made by the ES Project Team to gather site-specific information including: (1) visual evidence of environmental stress; (2) the presence of nearby drainage ditches or surface water bodies; and (3) visual inspection of these water bodies for any obvious signs of contamination or leachate migration.

A decision was then made, based on all of the above information, whether a potential exists for hazardous material contamination at any of the identified sites using the Decision Tree shown in Figure 1.1. If no potential existed, the site was deleted from further consideration. For those sites where a potential for contamination was identified, a determination of the potential for migration of the contamination was made by considering site-specific conditions. If there were no further environmental concerns, then the site was deleted. If the potential for contaminant migration was considered significant, then the site was evaluated and prioritized using the Hazard Assessment Rating Methodology (HARM). A discussion of the HARM system is presented in Appendix G. The sites that were evaluated using the HARM procedures were also reviewed with regard to future land use restrictions.

FIGURE 1.1

PHASE I INSTALLATION RESTORATION PROGRAM

DECISION TREE



CHAPTER 2

INSTALLATION DESCRIPTION

CHAPTER 2

INSTALLATION DESCRIPTION

LOCATION, SIZE AND BOUNDARIES

Shaw Air Force Base is located in Sumter County, South Carolina (Figures 2.1 and 2.2). It is situated approximately seven miles west of the City of Sumter, the nearest city with a population over 10,000. It is approximately forty-four miles east of Columbia, the state capitol. The base is located in a semi-rural area with most neighboring areas either vacant, wooded or used for agricultural purposes. Some residential and commercial development has occurred on property adjacent to the base. Figure 2.3 depicts the configuration of the 3,336 acres comprising Shaw AFB. Several annexes under the jurisdiction of Shaw AFB were also included in this study. These areas are described below and depicted in Figure 2.2.

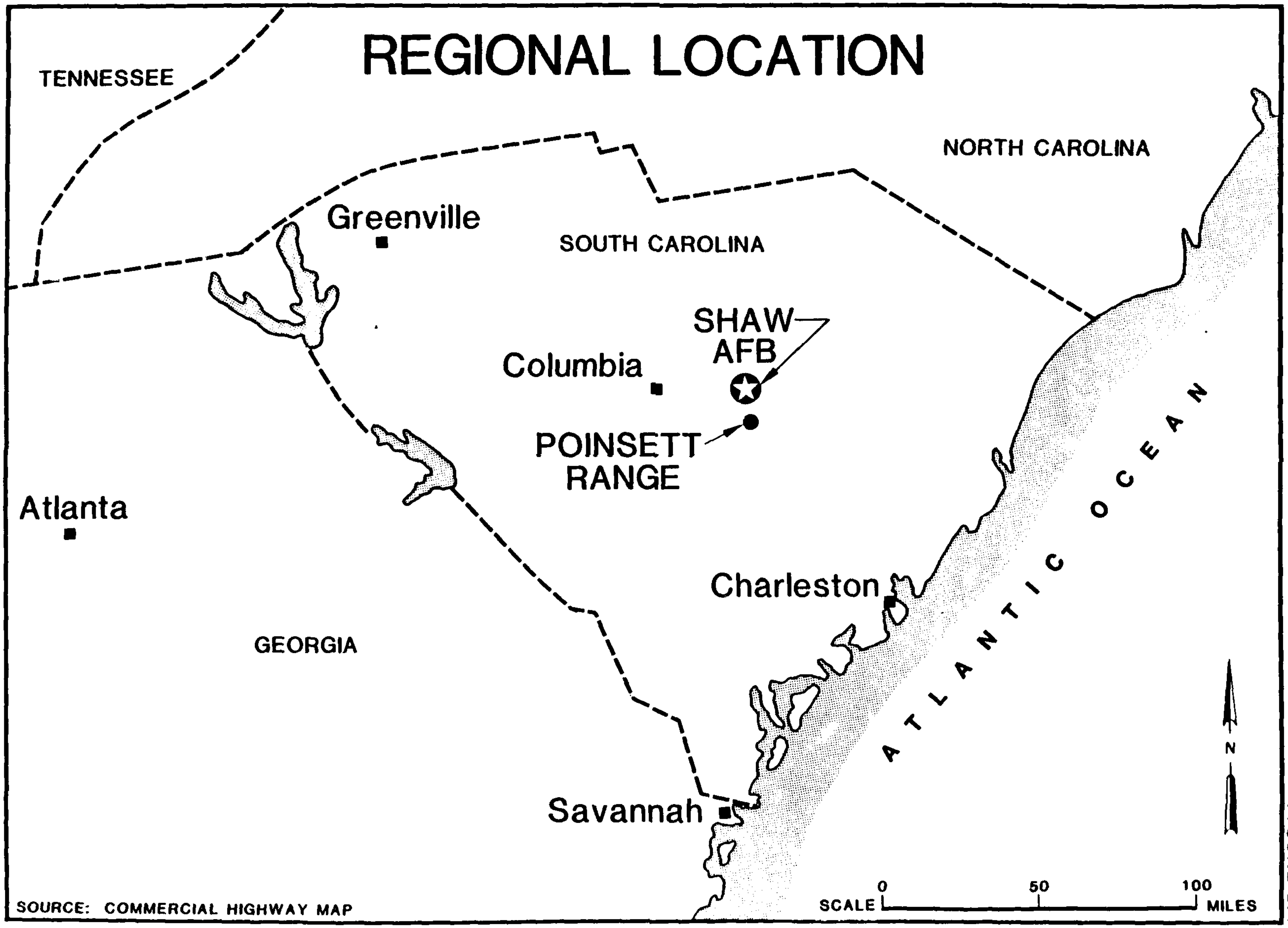
Shaw TACAN Navigational Aid: 0.15 acres of Air Force-owned land located 9,240 feet from the end of Runway 22R. The site provides navigational aids to support the flying operation at Shaw AFB. The site houses a small diesel generator and fuel storage tank.

Shaw Middle Marker Annex: 0.23 acres of Air Force-owned land located seven miles west of Sumter along the extended center line of Runway 04L. The site houses the middle marker for the Category I Solid State Instrument Landing System. The site also houses a small diesel generator and fuel storage tank.

Poinsett Range: 8,038.5 acres of leased land located seven miles south of Shaw AFB. The site is a Type III, Class A, single conventional fighter range used for practice and qualification in air-to-ground delivery of training ordnance.

Wateree Recreational Annex: 23.5 acres of leased land located 34 miles northwest of Shaw AFB on the eastern shore of Lake

FIGURE 2.1



ES ENGINEERING-SCIENCE

FIGURE 2.2

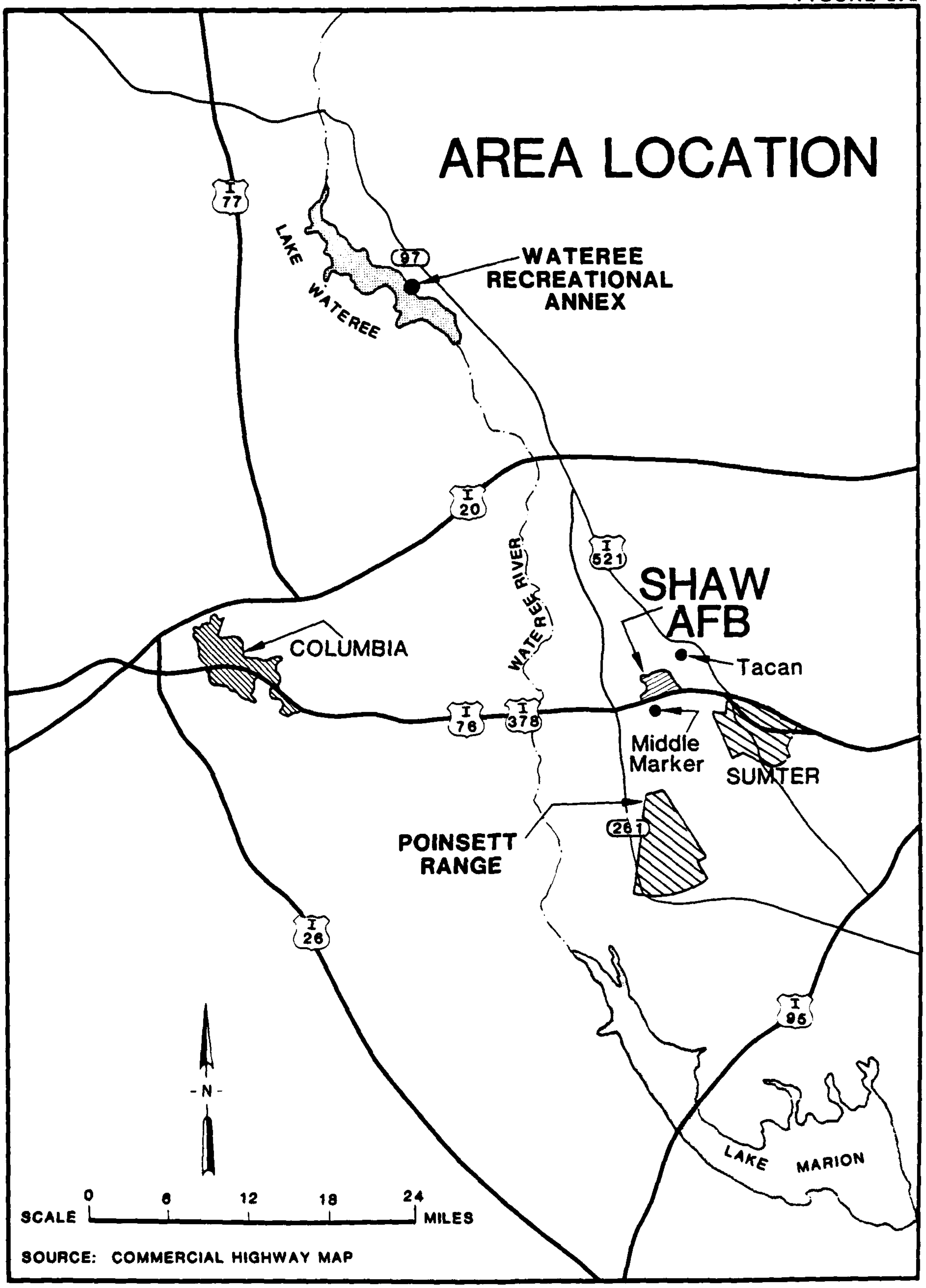


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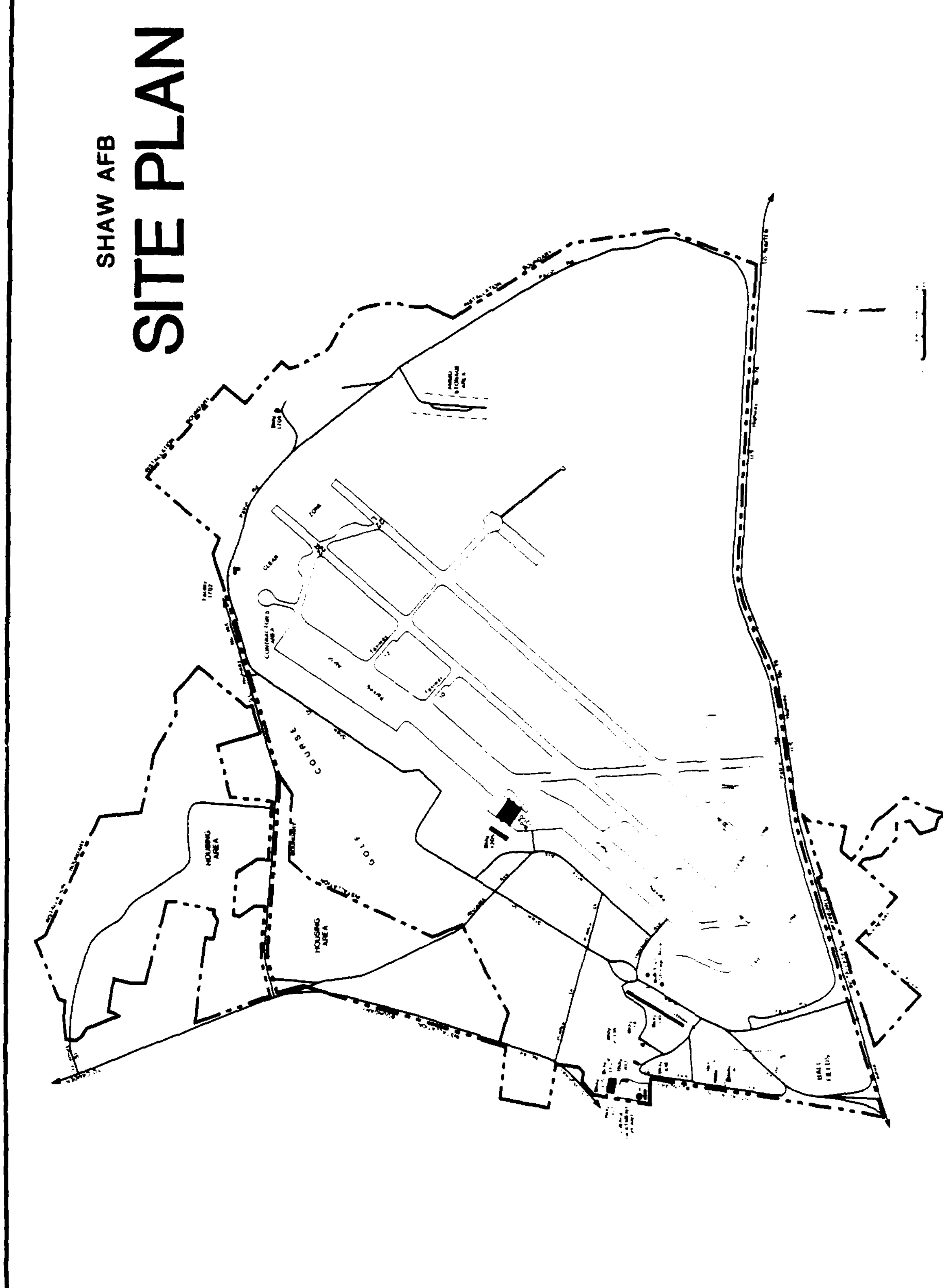
FIGURE 2.3



SHAW AFB
SITE PLAN

SOURCE : SHAW AFB INSTALLATION DOCUMENTS

Wateree, Kershaw County, SC. The site is an off-base recreational area designed for day, overnight and extended use. The 703rd TASS uses Lake Wateree for training helicopter pilots in water landing and take off. Septic tanks are used for disposing of domestic wastes. There are no landfills on the site. Wells provide potable water for the facility.

BASE HISTORY

Construction of the Shaw Field began in July, 1941, and the field was officially activated on August 30, 1941, as a basic flying school under the jurisdiction of the Southeast Training Center. Its mission was to train cadets and student officers in basic flying. The base began full operations on December 15, 1941, when the first class of 138 cadets arrived. The base's last basic flying class departed in March, 1945. After World War II, Shaw Field became a major separation center for post-war personnel discharges.

On March 31, 1946, control of the base was transferred from the First Air Force to the Tactical Air Command (TAC), and the 20th Fighter Group arrived at Shaw equipped with P-51 aircraft. In 1947, 2,300 feet were added to the NE-SW Runway, extending the primary runway to Taxiway No. 10 for a total of 6,800 feet. In January 1948, Shaw Field was transferred to the Continental Air Command and redesignated Shaw Air Force Base. The 20th Fighter Wing, which had recently become the base's host unit, received its first jet aircraft, the F-84, shortly thereafter.

The base was reassigned to TAC on December 1, 1950. During the following month, it became a Ninth Air Force base, where it has remained to date. The 363rd Tactical Reconnaissance Wing arrived at Shaw in April 1951 and later that year became the principal unit on base. An additional 1,200 feet were added to the primary runway extending it to Taxiway No. 12 for a total of 8,000 feet. By mid-1952, the runway had been extended to its present 10,000 foot length. The Ninth Air Force and the 507th Tactical Control Group moved their headquarters from Pope AFB, NC to Shaw in July of 1954. Among the reconnaissance aircraft assigned to Shaw since that time are the RF-80 and RB-26, the RF-84, RF-101, RB-57, EB-66 and RF-4C.

In June of 1974, the aircraft, vehicles, and personnel of the 68th Tactical Air Support Group were consolidated with the 507th Tactical Control Group to form a single unit. In 1976, the 507th became a full tactical air control wing, establishing Shaw as a two-wing base. July 1982 marked the activation of the 19th Tactical Fighter Squadron, which consists of the new F-16 jet aircraft. The 17th Tactical Fighter Squadron, also flying F-16's, was activated shortly thereafter, in October 1982.

ORGANIZATION AND MISSION

The present host organization at Shaw AFB is the 363rd Tactical Fighter Wing whose primary mission is to employ tactical reconnaissance and fighter forces capable of meeting all operational requirements worldwide, to maintain a state of combat readiness and to operate Shaw by providing facilities, personnel and material.

Tenant organizations at Shaw AFB are listed below. Descriptions of the major base tenant organizations and their missions are presented in Appendix C.

507th Tactical Air Control Wing
21th Tactical Air Support Squadron
4507th Consolidated Aircraft Maintenance Squadron
703rd Tactical Air Support Squadron
9th Tactical Intelligence Squadron
682nd Direct Air Support Operations Center
507th Tactical Air Control Center
Field Training Detachment 307
DET 2, 1402nd Military Airlift Squadron
3537th USAF Recruiting Squadron
Ninth Air Force (TAC)
2020th Communications Squadron
USAF Regional Hospital
Base Weather, DET 1, 3rd Weather Squadron
DET 1372 Air Force Audit Agency
DET 2102, District 21, Office of Special Investigations
DET 16, 4400 Management Engineering Squadron (TAC)
DET 1, 1701 Mobility Support Squadron (MAC)

DET 3, AF Commissary Service

DET 9, Tactical Communication Area (AFCS)

DET EGOO, 6948 Security Mobility (USAFSS)

District 23, Defense Investigative Service

DET QD20 (USAF) Area Defense Counsel

USAF Postal Service Center

USAF Trial Judiciary/Area Defense Council

Defense Property Disposal Office

CHAPTER 3

ENVIRONMENTAL SETTING

CHAPTER 3

ENVIRONMENTAL SETTING

The environmental setting of Shaw Air Force Base is described in this chapter with the primary emphasis directed toward identifying features which may facilitate the movement of hazardous waste contaminants. A summary of the environmental setting pertinent to the study is presented at the conclusion of this section.

METEOROLOGY

Temperature, precipitation and snowfall data furnished by Detachment 1, 3rd Weather Squadron, Shaw AFB, are presented in Table 3.1. The period of record is 32 years. The summarized data indicate that the mean net annual precipitation is 45.8 inches. This corresponds with the value obtained from the National Oceanic and Atmospheric Administration Climatic Atlas of the United States (NOAA, 1977). The NOAA has determined that the mean annual Class A pan evaporation for the area is 56 inches with a 76 percent coefficient. These values result in a calculated mean net precipitation of approximately three inches. This area has a 10 year-24 hour rainfall intensity of 5.9 inches.

GEOGRAPHY

Shaw Air Force Base is located within the Atlantic Coastal Plain Physiographic Province (Lobeck, 1950). The study area is divided into the Tertiary Upland, which is characterized by dissected sand hills and a Miocene Flatland, characterized by flat-lying terrain (Johnson, 1959). Major features include nearly level plains, rolling uplands, extensive surficial dissection, mature streams and swampy areas. A unique aspect of the lowland areas are the "Carolina Bays", elongate oval depressions in the land surface. Numerous Carolina Bays may be observed in the project area.

Upland stream valleys possess "V-type" channels when viewed in cross section, indicative of rapidly eroding sandy soils. Flatland

TABLE 3.1
SHAW AFB CLIMATIC CONDITIONS
Period of Record: 1946-1978

MONTH	Temperature (°F)					Precipitation (In)				Snowfall (In)		
	Mean			Extreme		Monthly				Monthly		
	Daily		Monthly						Max			Max
	Max	Min		Max	Min	Mean	Max	Min	24 Hrs	Mean	Max	24 Hrs
Jan	56	37	47	81	8	3.4	7.4	0.7	3.8	#	3	3
Feb	59	38	49	82	9	3.6	6.5	0.3	2.7	1	17	14
Mar	66	45	56	90	20	4.4	12.7	1.3	5.7	#	4	4
Apr	75	54	65	95	30	3.3	10.1	0.4	2.7	0	0	0
May	82	62	73	99	40	3.6	9.6	0.4	3.5	0	0	0
Jun	88	69	78	106	50	5.5	17.8	1.5	7.5	0	0	0
Jul	90	72	81	105	60	5.4	13.4	0.7	3.5	0	0	0
Aug	89	71	80	102	58	4.7	14.5	1.2	4.0	0	0	0
Sep	84	66	75	101	44	3.4	6.6	0.3	4.0	0	0	0
Oct	75	55	65	99	30	7.6	9.1	#	3.9	#	#	#
Nov	66	45	56	88	16	2.6	7.8	0.3	2.3	#	#	#
Dec	58	38	48	82	8	3.3	6.5	0.3	2.9	#	5	5
Annual	74	54	64	106	8	45.8	17.8	#	7.5	1	17	14

Source: Detachment 1, 3rd Weather Squadron, Shaw Air Force Base
#: Trace

stream channels exhibit a "sag and swale" appearance, suggesting the presence of somewhat cohesive, fine-grained soils that tend to resist erosional effects. Figure 3.1 depicts study area physiographic divisions.

Topography

The topography of Shaw Air Force Base ranges from generally level to rolling in appearance. Local relief is primarily the result of dissection by erosional activity or stream channel development. Installation surface elevations range from a low of 200 feet National Geodetic Vertical Datum (NGVD) at the southeast corner of the base to 350 feet NGVD in the vicinity of Shaw View Heights County School.

Drainage

Drainage of Shaw AFB land areas is accomplished by overland flow to diversion structures and then to area surface streams, all of which are tributaries of the Pocataligo River. Typically, surface drainage from the north and east portions of the base are directed to Long Branch Creek. A smaller amount of surface drainage originating from the south (airfield) part of the installation drains to Mush Swamp and Bluffhead Branch, south of U.S. Highway 76. Minor amounts of interior drainage from installation urban areas is directed to the base lakes. Intermittant overflows drain to the North Ditch. Figure 3.2 depicts Shaw AFB surface water drainage features.

Surface Soils

Study area surface soils have not been described in the most recent Soil Survey issued by the USDA, Soil Conservation Service (1974). Most base soils are presumed to be altered, buried or completely removed due to base development and site use modification activities. Near surface soils can, however, be described in terms of area physiography (refer to Figure 3.1). According to Johnson (1959), the Tertiary Upland is underlain by sands, clays and consolidated rocks. Most of the surface area soils consist of homogeneous red sandy clay, reaching a thickness of twenty feet. Flatland surface soils are described as clayey sands, sandy clays and clays, approximately twenty feet thick. Based upon these descriptions, study area surficial soils are estimated to possess moderate to low permeabilities.

FIGURE 3.1

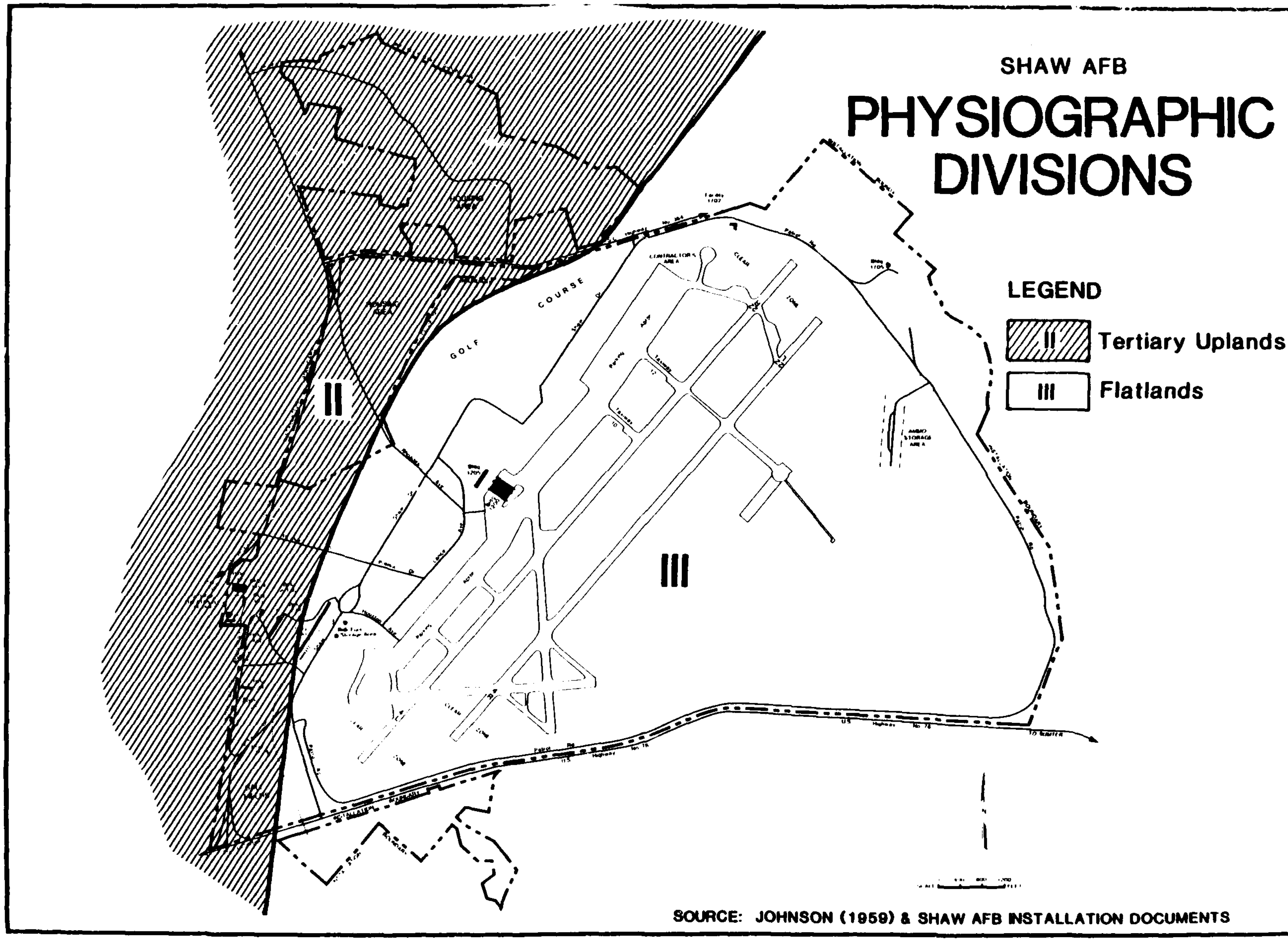
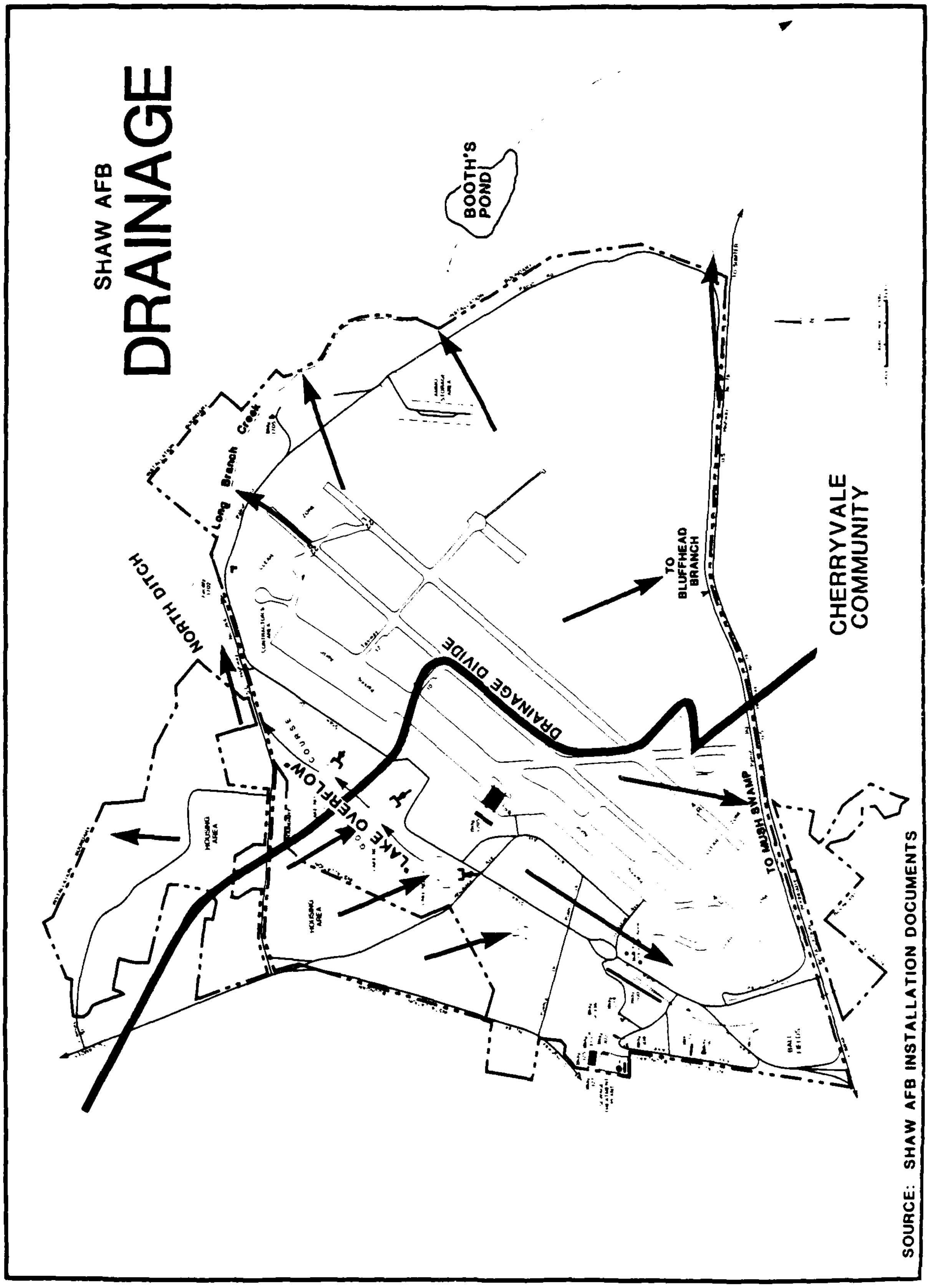

SHAW AFB
PHYSIOGRAPHIC DIVISIONS
LEGEND
II Tertiary Uplands
III Flatlands
II
III
GOLF COURSE
SOURCE: JOHNSON (1959) & SHAW AFB INSTALLATION DOCUMENTS

FIGURE 3.2


SHAW AFB
DRAINAGE
BOOTH'S POND
Long Branch Creek
NORTH DITCH
DRAINAGE DIVIDE
"LAKE OVERFLOW"
COURSE
HOUSING AREA
HOUSING AREA
TO BLUFFHEAD BRANCH
TO MUSH SWAMP
CHERRYVALE COMMUNITY
SOURCE: SHAW AFB INSTALLATION DOCUMENTS

GEOLOGY

Study area geology has been described in reports prepared by Cooke (1936), Cook and MacNeil (1952), Siple (1957), Johnson (1959), Park (1980), Hardee (1981) and McFadden (1981). Additional information has been obtained from an interview with a U.S. Geological Survey (USGS) hydrogeologist. A brief review of their work and pertinent comments have been summarized to support this investigation.

Stratigraphy

Geologic units ranging in age from Cretaceous to Quaternary have been identified in the Coastal Plain of South Carolina. These units are typically unconsolidated materials consisting of gravel, sand, silt, clay and marl, reposing on a consolidated rock basement complex of Triassic sedimentary rocks and Permian to Ordovician crystalline (metamorphic and igneous) rocks. Although the unconsolidated units may be somewhat similar in character, they can usually be differentiated by variations in color, mineralogy, lithology and fossils present. Table 3.2 summarizes the major geologic units identified in the Sumter-Florence Counties area of the South Carolina Coastal Plain and describes their significant characteristics, in chronological sequence.

Distribution

The surface distribution of geologic units relevant to this study is presented as Figure 3.3 which has been modified from Cooke (1936). Generally, the geology of terrace areas at Shaw Air Force Base are dominated by relatively thin sections of Holocene to Pleistocene sediments consisting of gravel, sand, clay, sandy clay and local occurrences of sandy limestone. Lowland area geology is characterized by thin sections of Pliocene sands interbedded with calcareous marls. These relatively recent materials are underlain by the major geologic units summarized in Table 3.2. The major geologic units crop out in southwest to northeast trending belts which extend across the Coastal Plain.

Some geologic information has been obtained from test borings drilled at Shaw Air Force Base. Figures 3.4 and 3.5, the logs of two widely separated test borings depict base surficial geologic conditions. Boring 24 (Figure 3.4), drilled in the southeast corner of the installation (elevation 210 feet), encountered silty and clayey sands. Boring

TABLE 3.2

SUMMARY OF GEOLOGIC UNITS PRESENT IN SUMTER AND FLORENCE COUNTIES, SC

System	Series	Formation	Aquifer System	Lithology	Hydrologic Properties
Quaternary	Holocene and Pleistocene	Terrace Deposits	Shallow	Light-colored medium to coarse-grained sands, gravels, and lenses of vari-colored clays and sandy clays; locally sandy limestone.	Poorly known. Ground water probably occurs under watertable or semi-confined conditions. Apparently supplies sufficient water from drilled or dug wells for domestic use. Water may locally contain high iron.
Tertiary	Pliocene	Unnamed	Shallow	Light-colored, fine- to coarse-grained sands interbedded with dark, sandy, calcareous marls; phosphate pebbles locally.	Poorly known. Ground water probably occurs under watertable or semi-confined conditions. Apparently supplies sufficient water from drilled or dug wells for domestic use. Water may locally contain high iron.
		Duplin Formation	Shallow	Light-grey, yellow, brown, and buff, fossiliferous, fine- to coarse-grained sands; and green and grey clays, marls, and soft fossiliferous limestone. Maximum thickness - 50 ft.	Water-bearing characteristics unknown in most of study area. Confining unit in some areas. Yields sufficient good quality water for domestic uses and small public-supply systems.
	Miocene	Unnamed	Shallow	Fine- to medium-grained argillaceous sands.	Only a few feet thick where present.
	Eocene	Black Mingo Formation Paleocenc	Shallow	Glauconitic fine-grained quartz sands; thin beds of grey to light-green silty clay; and beds of opaline (siliceous) claystone.	Hydraulic characteristics and water quality poorly defined. Sands and shelly sands may yield water for domestic purposes in some areas. Primarily a confining bed where composed of siliceous claystone.

TABLE 3.2

SUMMARY OF GEOLOGIC UNITS PRESENT IN SUMTER AND FLORENCE COUNTIES, SC

(Continued)

System	Series	Formation	Aquifer System	Lithology	Hydrologic Properties
Cretaceous	Upper Cretaceous	Peedee Formation	Peedee	Fossiliferous, calcareous, light-grey sandy clays; beds of dark-grey limestone; and beds of fine- to medium-grained sand.	Artesian aquifer. Hydraulic characteristics and water quality poorly defined. Should yield sufficient water for domestic and light industrial purposes. Aquifer system includes part of Black Creek Formation locally.
		Black Creek Formation	Black Creek	Fossiliferous, pyritic, lignitic, white to grey, fine- to medium-grained, micaceous, glauconitic, phosphatic sands; and blue-grey to black pyritic, plastic, or brittle clays.	Major artesian aquifer. Wells yield moderate to large quantities of ground water -- commonly over 500 gpm/well. Dissolved solids generally low but locally contains high iron concen-Often developed with Tuscalosa aquifer system. trations. Aquifer system includes rocks of Tuscaloosa Formation in most of Sumter County.
		Middendorf	Middendorf	Lignitic, buff, yellow, tan, and grey, mixed fine- to coarse-grained feldspathic, micaceous sands, interbedded with grey, yellow, brown, and red kaolinitic clays, and silty to sandy clays.	Major artesian aquifer. Large diameter wells yield over 500 gpm/well. Transmissivity values range from 900 to 9,000 ft^2/d. Water often high in iron, acidic (pH=4.6-6.5), and low in dissolved solids. Aquifer system includes rocks of Black Creek Formation in southeastern part of study area.
Triassic		Unnamed Triassic Rocks	Bedrock	Red- to reddish-brown consolidated claystone, sandstone, shale, and conglomerate; occurring in a narrow Triassic basin west-southwest of Florence, SC, and may extend to Sumter.	Occurs in subsurface only. No known wells tap bedrock in study area and hydrologic characteristics unknown. Mainly a confining unit and not a source of ground water in study area.
Permian to Ordovician		Unnamed Crystalline Rocks	Bedrock	Mainly inferred as granite, gneiss, schist, phyllite.	Occurs in subsurface only No known wells tap bedrock in study area and hydrologic characteristics unknown. Mainly a confining unit and not a source of ground water in study area.

Source: Modified from Park (1980)

FIGURE 3.3

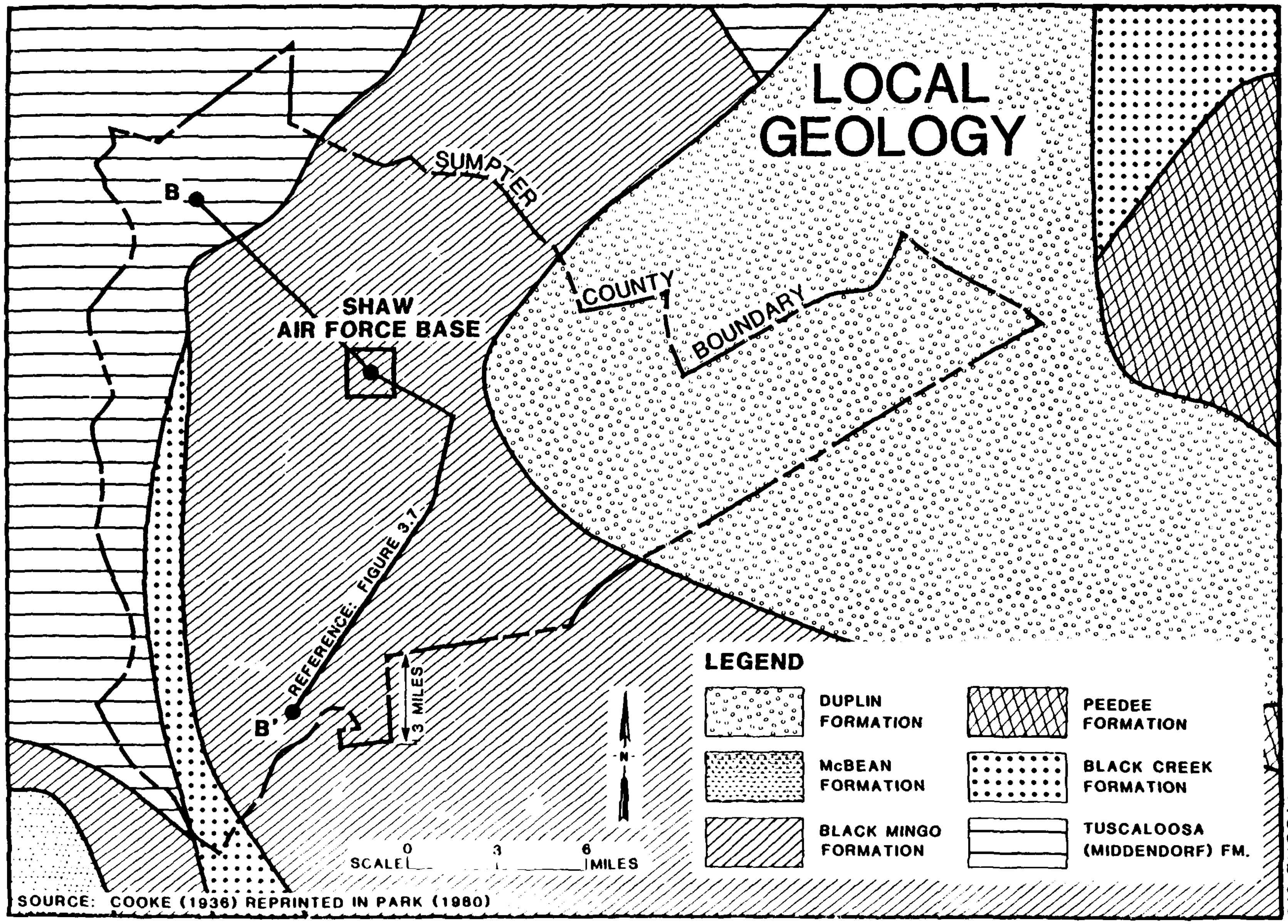


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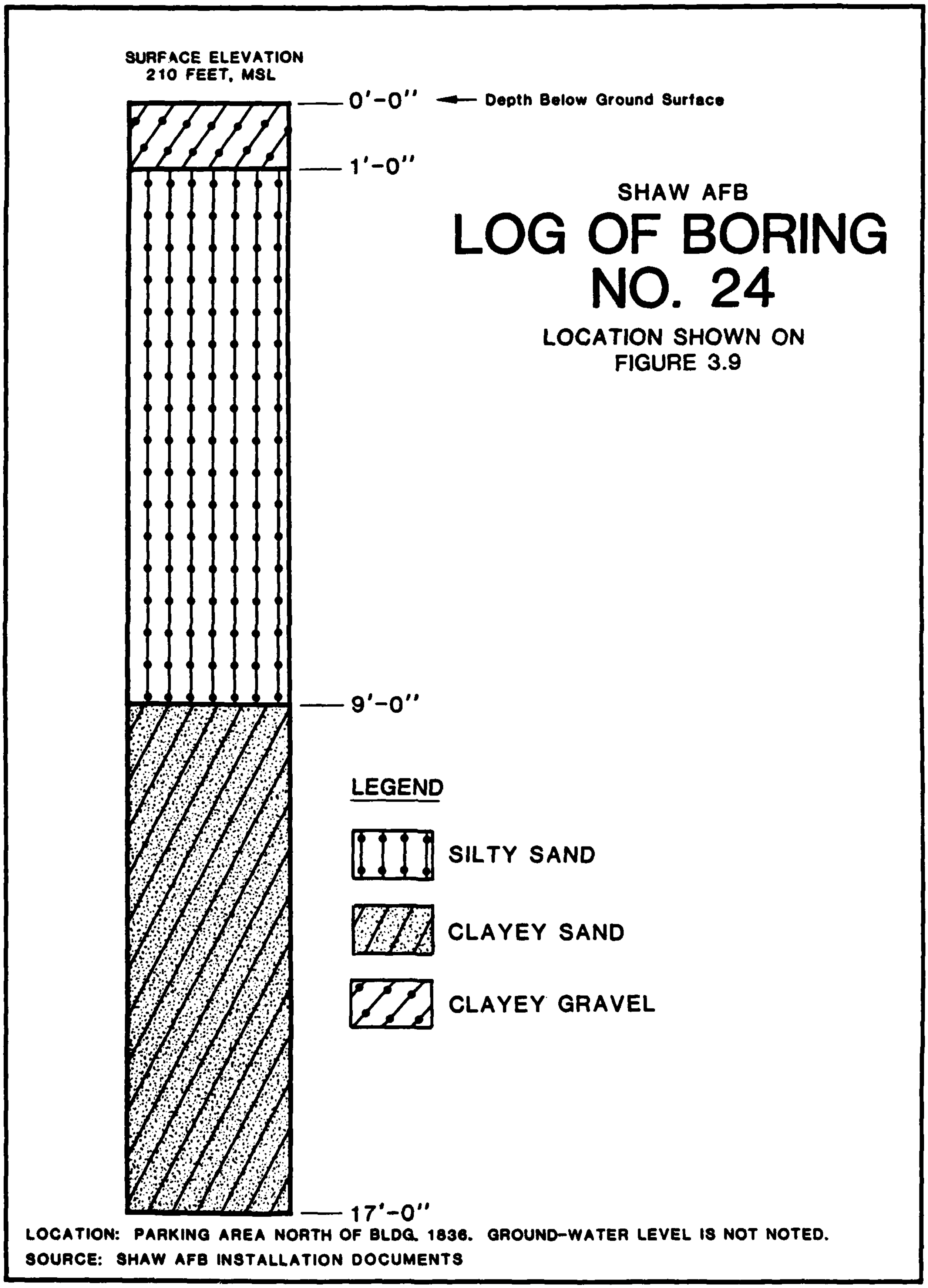
FIGURE 3.4



SURFACE ELEVATION
210 FEET, MSL
0'-0"
Depth Below Ground Surface
1'-0"
SHAW AFB
LOG OF BORING
NO. 24
LOCATION SHOWN ON
FIGURE 3.9
9'-0"
LEGEND
SILTY SAND
CLAYEY SAND
CLAYEY GRAVEL
17'-0"
LOCATION: PARKING AREA NORTH OF BLDG. 1836. GROUND-WATER LEVEL IS NOT NOTED.
SOURCE: SHAW AFB INSTALLATION DOCUMENTS

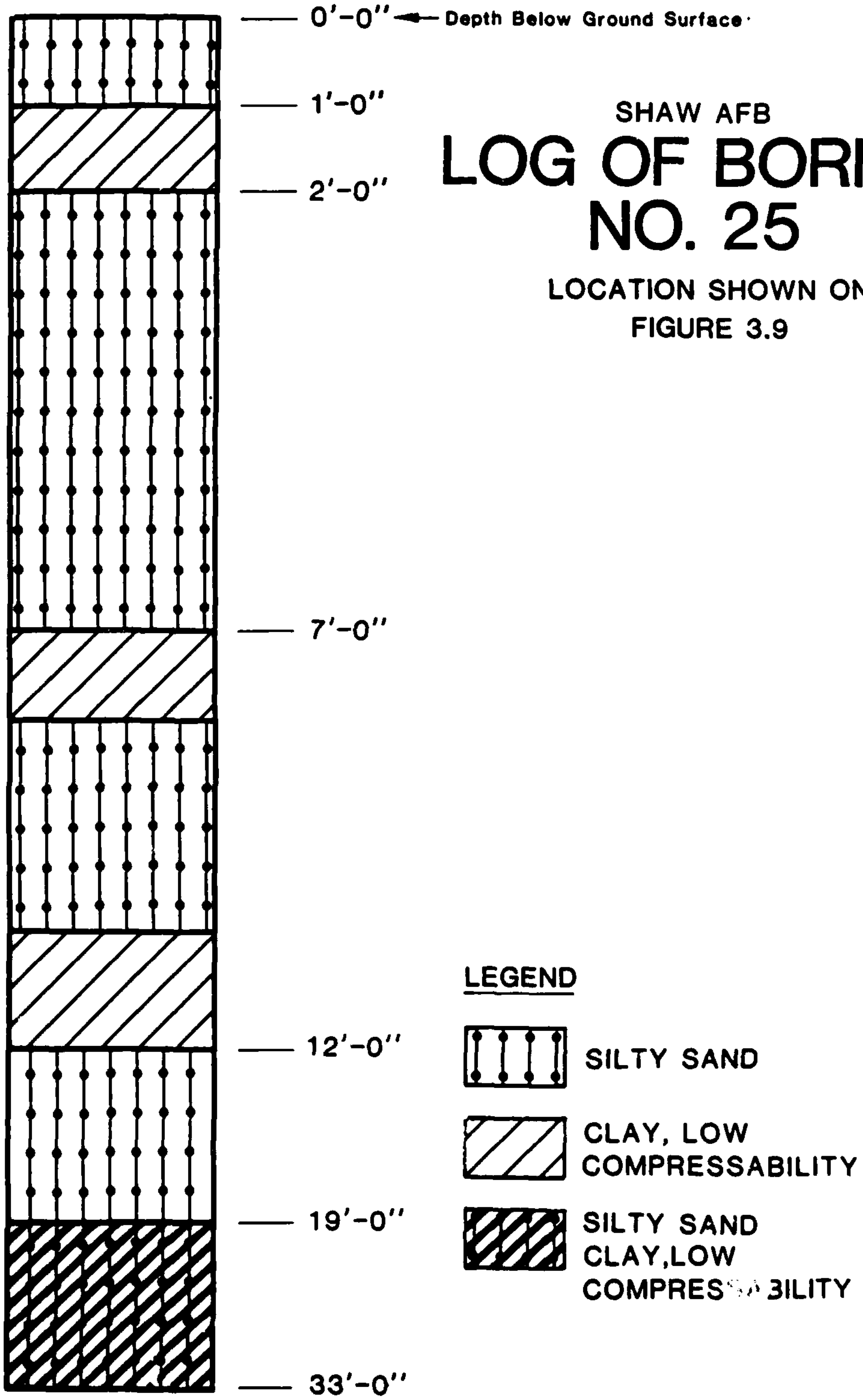
FIGURE 3.5

SHAW AFB

LOG OF BORING NO. 25

LOCATION SHOWN ON FIGURE 3.9

SURFACE ELEVATION
295 FEET, MSL



LOCATION: 100 FEET WEST OF BLDG. 1402. GROUND-WATER LEVEL NOT NOTED.

SOURCE: SHAW AFB INSTALLATION DOCUMENTS

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25 (Figure 3.5), drilled in the northwest section of the base at elevation 295 feet, encountered alternating layers of silty sands and slightly plastic clays.

Structure

South Carolina Coastal Plain sediments occur as a southeast dipping wedge, with a point of origin at the Fall Line at Lugoff, S.C. The accumulation of sediments thicken gradually to the southeast (seaward), to more than 3,500 feet (Siple, 1959). Johnson (1959) and Park (1980) estimate their thickness to be on the order of 700 feet in the study area. Shallow sedimentary units such as the Peedee Formation dip southeast at an average rate of seven feet per mile (Park, 1980). The dip increases with depth; basement complex rocks exhibit an average dip of some 36 feet per mile and strike north 66° east. Figure 3.6, modified from McFadden (1981), depicts major study area structural features in a geologic cross section.

HYDROLOGY

Introduction

Ground-water hydrology of the project area has been reported by Siple (1955), Cederstrom et al. (1979), Park (1980), Hardee (1981) and McFadden (1981). Additional information has been obtained from interviews with U.S. Geological Survey Water Resources Division and South Carolina Department of Health and Environmental Control personnel.

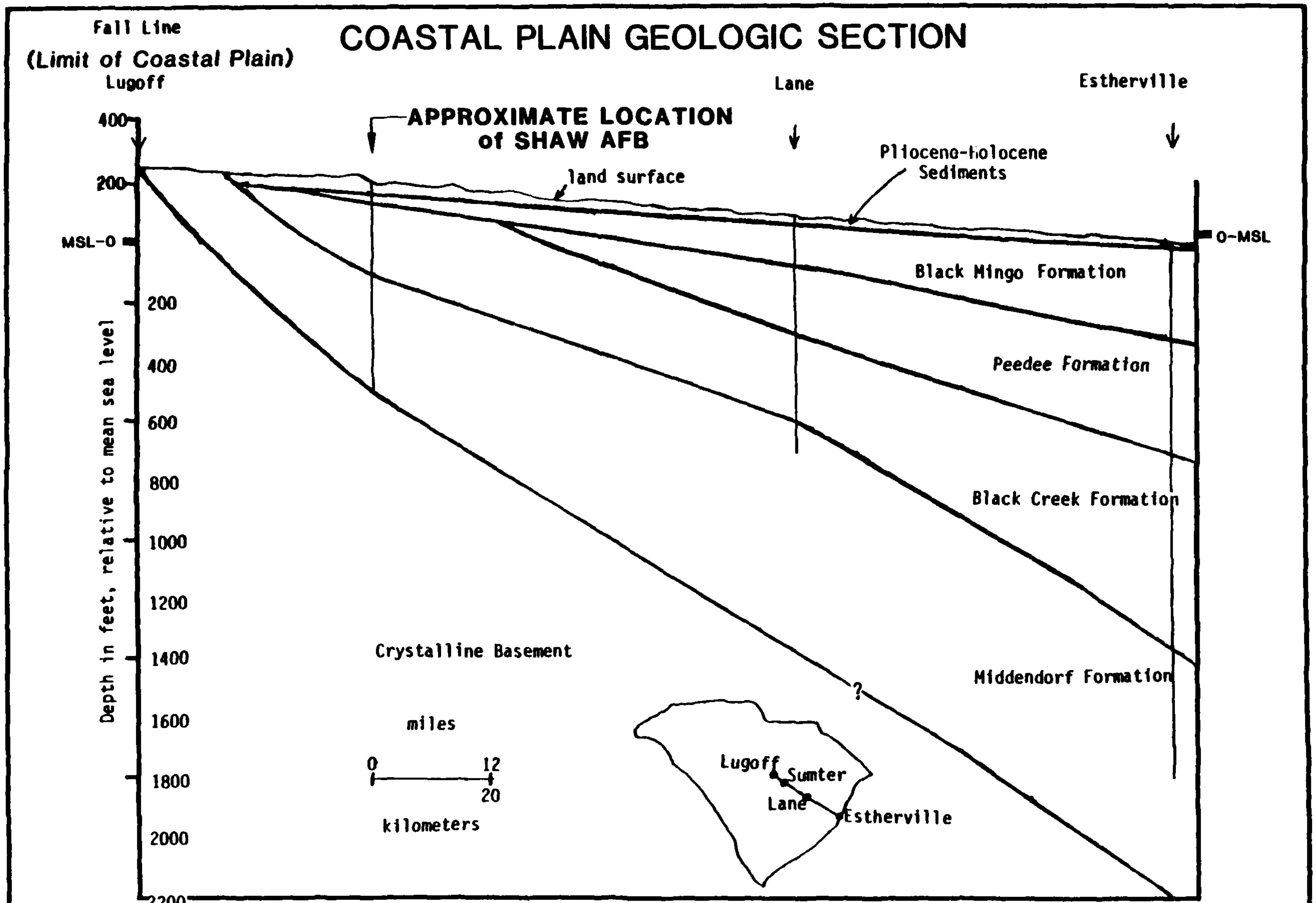
Hydrogeologic Units

Shaw Air Force Base lies within the middle section of the South Carolina Coastal Plain. In this area, several major hydrogeologic units have been identified, which are listed in Table 3.2 and shown in cross section on Figure 3.7. The units of particular interest to this investigation are as follows:

- Shallow System
- Black Creek
- Middendorf (also identified as "Tuscaloosa")

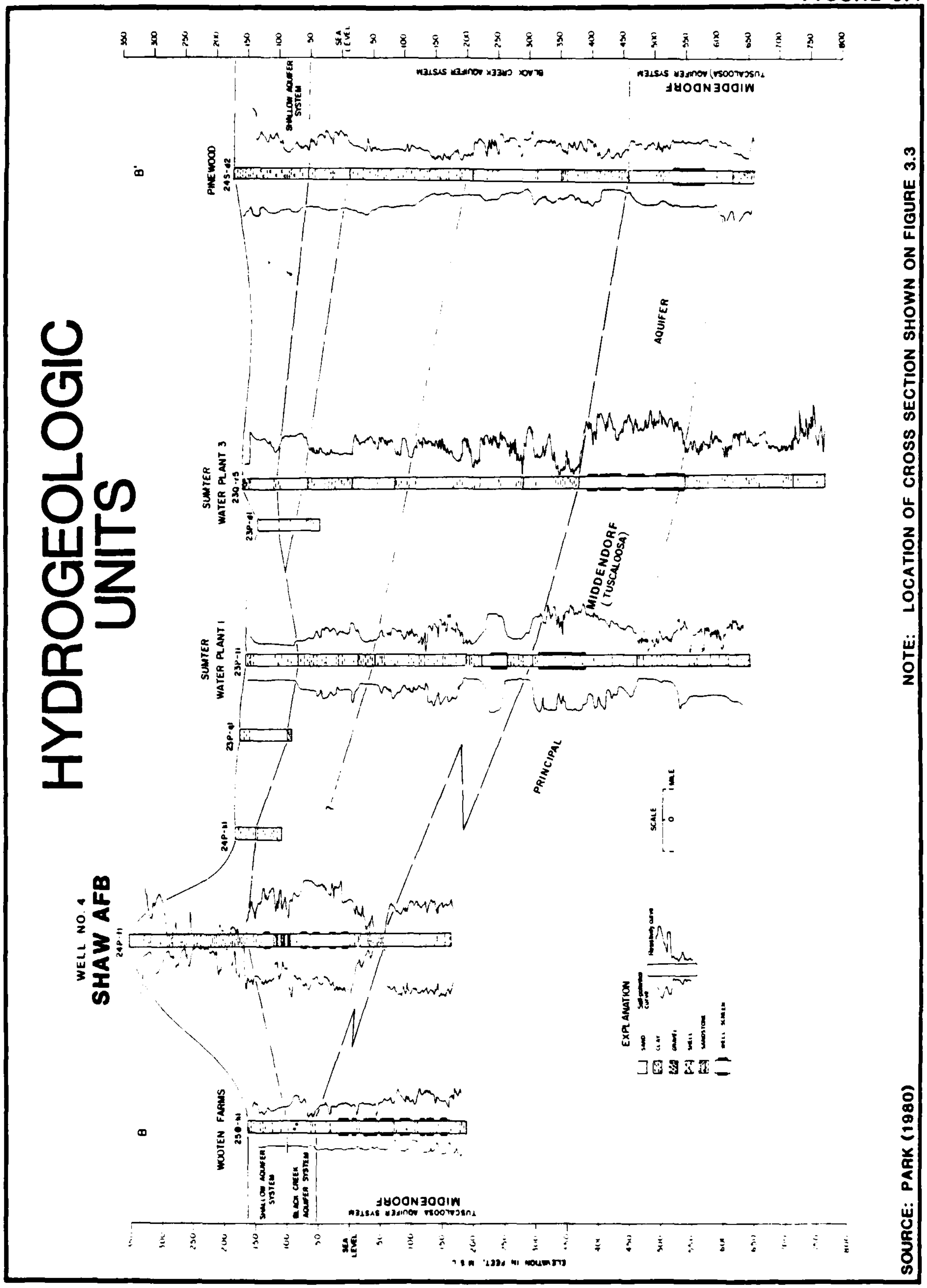
The Peedee Formation is not known to be represented in a significant sequence in the study area, is not a major water source, and is, therefore, not included in this discussion.

FIGURE 3.6



SOURCE: McFADDEN, (1981)

FIGURE 3.7



HYDROGEOLOGIC UNITS

NOTE: LOCATION OF CROSS SECTION SHOWN ON FIGURE 3.3

SOURCE: PARK (1980)

Shallow System

The study area Shallow System consists of Holocene and Pleistocene terrace deposits, Pliocene undifferentiated materials and the Duplin Formations Miocene unnamed strata and the Eocene-Paleocene Black Mingo Formation (all of which are described in Table 3.2). The shallow aquifer system occurs at or near land surface in the study area and consists principally of sand, gravel and clay. Park (1980) postulates its thickness reaches a maximum of approximately 150 feet at Shaw AFB well number four. According to Hardee (1981), depositional similarities of the Black Mingo and overlying sediments make delineation of geologic unit boundaries difficult, therefore, it is common practice to consider all post-Cretaceous materials as the area's shallow aquifer.

The surficial sediments of the shallow system are reported to be highly permeable (Hardee, 1981), permitting the rapid recharge of underlying units by precipitation and thus limiting the amount of runoff leaving the study area. Based upon observations of the study area, it appears that Shaw Air Force Base is located within the recharge area of the shallow aquifer system.

Ground-water levels within the upper aquifer are generally ten to forty feet below land surface, according to Hardee (1981) and Park (1980). Shaw AFB wells screened into the shallow aquifer possess static water levels averaging twenty feet below land surface. Ground-water exists in the shallow system under water table (unconfined) conditions, but locally may be semi-confined or artesian. Shallow system ground-water flow directions are subject to local controls. At Booth Farms, east of Shaw Air Force Base, shallow system ground-water flow has been determined to be generally east (McFadden, 1981). At Cherryvale community, 1500 feet south of Shaw Air Force Base, ground-water flow was determined to be generally southeast (Hardee, 1981). It appears that in both cases, discharge is directed to local surface waters.

The Sh llow System is capable of producing water supplies for domestic, agricultural, industrial and municipal uses. Until the 1960's, the City of Sumter operated shallow wells, 55 to 100 feet deep, deriving as much as 450 gallons per minute per well. One well reportedly yielded 1000 gallons per minute (Park, 1980). In the study

area, shallow wells provide water service to the base, Booth's Farm and Cherryvale community. Shallow wells in the study area have been constructed both by drilling and jetting (Hardee, 1981 and McFadden, 1981).

Black Creek System

Immediately underlying the Shallow System is the Black Creek Formation, a major aquifer of regional significance in the study area. This unit consists of coarse sands, poorly sorted gravels and interbedded clays, thickening to the southeast (downdip). The Black Creek is present immediately below the shallow system at Shaw Air Force Base, beginning at elevation 160 feet MSL (approximately) and is estimated to be 225 feet thick at base well number four (Park, 1980). The degree of separation between the shallow system and the Black Creek is undefined and some interchange may occur between them locally (Speiran, 1983).

The Black Creek is recharged by precipitation falling on its outcrop areas, which are located several miles northeast and west of Shaw Air Force Base. Ground-water is present under artesian conditions and movement within the Black Creek is presumed to be downdip (southeast). According to Park (1980), Shaw AFB wells screened into the Black Creek exhibit static water levels ranging from 53 to 145 feet below ground surface. Widespread use of this aquifer has resulted in lowered artesian pressures since the 1940's. Because the Black Creek consists of numerous sand strata from which large quantities of water may be derived, most wells are constructed with multiple screens.

The Black Creek system furnishes adequate water supplies to Shaw Air Force Base, the cities of Florence and Sumter, small public water systems and individual users. Typically, these users construct large diameter wells ranging in depth from 150 to 600 feet. The lower limit of the Black Creek System is defined by a clay confining bed, ranging in thickness from 15 to 75 feet. Because the presence of this clay layer has been reasonably well defined, Park (1980) suggests that communication between the Black Creek and underlying Middendorf is slight.

Middendorf (Tuscaloosa) System

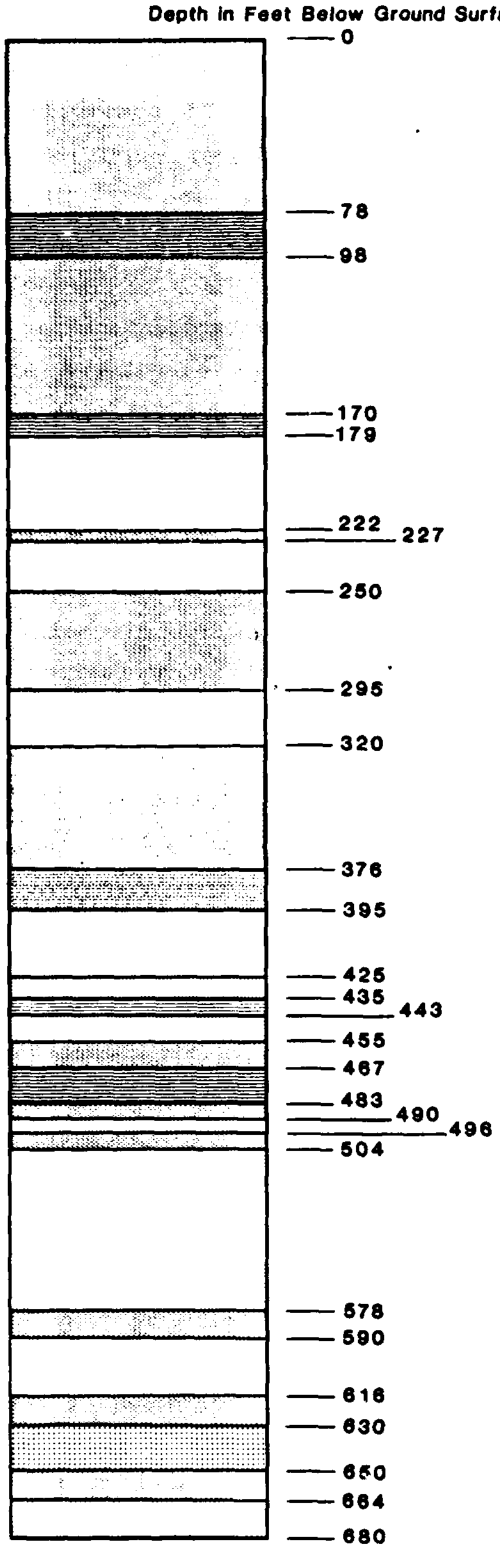
The Middendorf (Tuscaloosa) system is reported to be the region's most productive source of water supplies. It is estimated to range in thickness from 250 feet in northern Sumter County to 400 feet in

southern Florence County. According to Park (1980), the top of this aquifer was encountered at -50 feet MSL, at base well number four. Ground-water is usually present under artesian (confined) conditions in this unit. This is due to the confining effect of the clay layers interbedded among the water-producing sands and gravels. The Tuscaloosa Formation is the most prolific hydrogeologic unit of the area (in South Carolina, the name "Tuscaloosa" is being replaced by "Middendorf" as an identifier for units lithologically and chronologically correlative with those of the Southern and Gulf Coastal Plain). Wells drilled into this Formation are usually constructed with multiple screens to permit water intake from several productive zones along the vertical column of the well casing. Figure 3.8 is the log of a typical base well which depicts the interbedding of sands and clays in the hydrogeologic units present at the base.

The Middendorf is probably recharged by precipitation falling on outcrop areas north and west of the installation in Kershaw, Richland and Lee counties. Additional recharge may occur near larger pumping centers, where large-scale ground-water withdrawals have created drawdown features (cones of depression) in the regional potentiometric surface. Recharge may then be induced from overlaying aquifers. Ground-water flow directions within the Middendorf are believed to be generally toward the south and southeast. At Sumter, artesian water levels recorded from wells screened in the Middendorf ranged from 60 feet to 80 feet above mean sea level, Park (1980). This indicates that the upward flow of water from the Middendorf to the overlying Black Creek is possible where confining units are thin, discontinuous or absent, or where natural hydraulic gradients have been altered by pumpage.

Installation Wells

Shaw Air Force Base derives all of its water supplies from base wells, which are screened into the shallow aquifer, the Black Creek, or both. The installation water distribution system is composed of thirteen wells, whose locations are depicted on Figure 3.9. Basic well information, obtained from installation documents and Park (1980) is summarized in Table 3.3.



SHAW AFB

LOG OF SHAW AFB WELL NO. 7

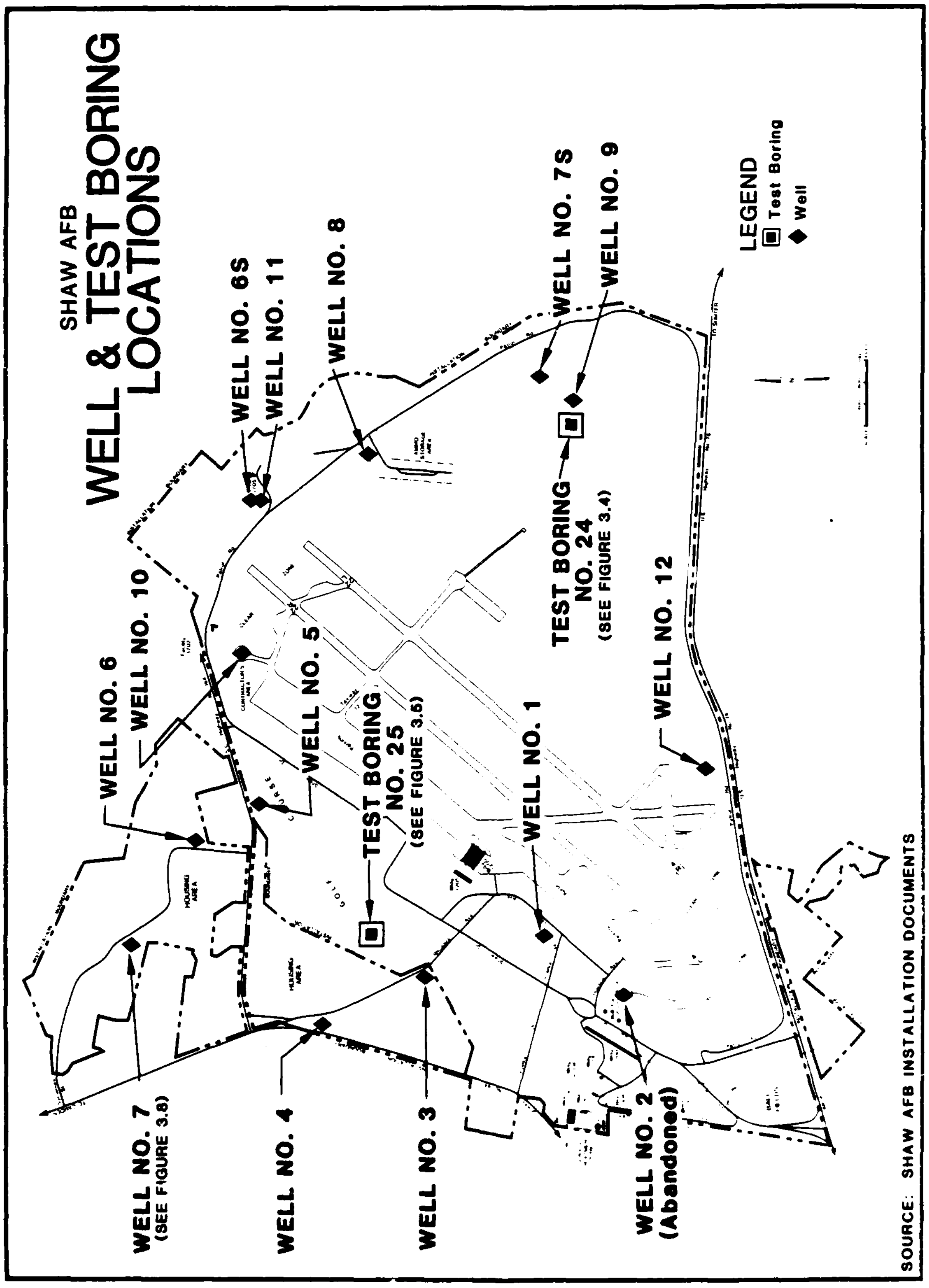
(LOCATION SHOWN ON FIGURE 3.9)

LEGEND

- SAND AND CLAY
- FINE SAND AND CLAY
- FINE TO MEDIUM SAND
- CLAY
- SAND
- COARSE TO FINE SAND, PINK CLAY
- SANDY CLAY
- ROCK
- MEDIUM SAND

SOURCE: SHAW AFB INSTALLATION DOCUMENTS

FIGURE 3.9



SHAW AFB
WELL & TEST BORING LOCATIONS
WELL NO. 6S
WELL NO. 11
WELL NO. 8
WELL NO. 7S
WELL NO. 9
WELL NO. 6
WELL NO. 10
WELL NO. 5
TEST BORING NO. 25 (SEE FIGURE 3.5)
WELL NO. 1
TEST BORING NO. 24 (SEE FIGURE 3.4)
WELL NO. 12
WELL NO. 7 (SEE FIGURE 3.8)
WELL NO. 4
WELL NO. 3
WELL NO. 2 (Abandoned)
LEGEND
Test Boring
Well
HOUSING AREA
HOUSING AREA
SOURCE: SHAW AFB INSTALLATION DOCUMENTS

TABLE 3.3
WELL DATA SUMMARY
SHAW AIR FORCE BASE

Base Well Number	Location	Date Constructed	Surface Elevation MSL	Diameter (inches)	Total Depth (Ft)	Aquifer	Static Below	Water Level, Ft Ground Surface/Date	Pump Capacity GPM	Remarks
1	522	1975	250	8	280	BC	75	9-15-75	650	
2	112	1941	250	8	160	S	--	----	---	Abandoned
3	2233	1951	315	10	401	BC	145	9-19-56	600	Repaired, 1976
4	2004	1960	360	10	515	BC, M	207	8-60	600	
5	1415	1959	300	10	352	BC	120	8-5-59	600	
6	3656	1981	340	12	580	BC; M	168	7-7-81	510	
6S	1709	1959	210	3	75	S	17	5-19-59	20	Abandoned (Dry)
7	5640	1980	260	12	680	BC, M	138	5-5-81	510	
7S	1819	1959	212	4	95	S	17	5-59	40	
8	1829	1964	222	6	100	S	24	7-64	85	
9	1830	1966	210	6	108	S	--	----	--	
10	9116	1973	250	--	293	BC	53	6-26-73	250	
11	1709	---	---	--	---	--	--	----	--	
12	1975	---	---	--	160	S	--	----	40	

Aquifer Codes: S = Shallow; BC = Black Creek; M = Middendorf; -- = unknown
Source: Installation documents and Park (1980)

Poinsett Range obtains its water supplies from a four-inch diameter, 50-foot deep well capable of producing 20 gallons per minute. The Wateree Recreation Area purchases water supplies on an as needed basis.

Ground-Water Quality

The quality of ground-water obtained from all three study area aquifers is generally good. However, locally, concentrations of iron, calcium, magnesium, fluoride, silica, hardness, total dissolved solids, pH and corrosivity may exceed drinking water standards due to natural variations in aquifer conditions (Park, 1980).

SURFACE WATER QUALITY

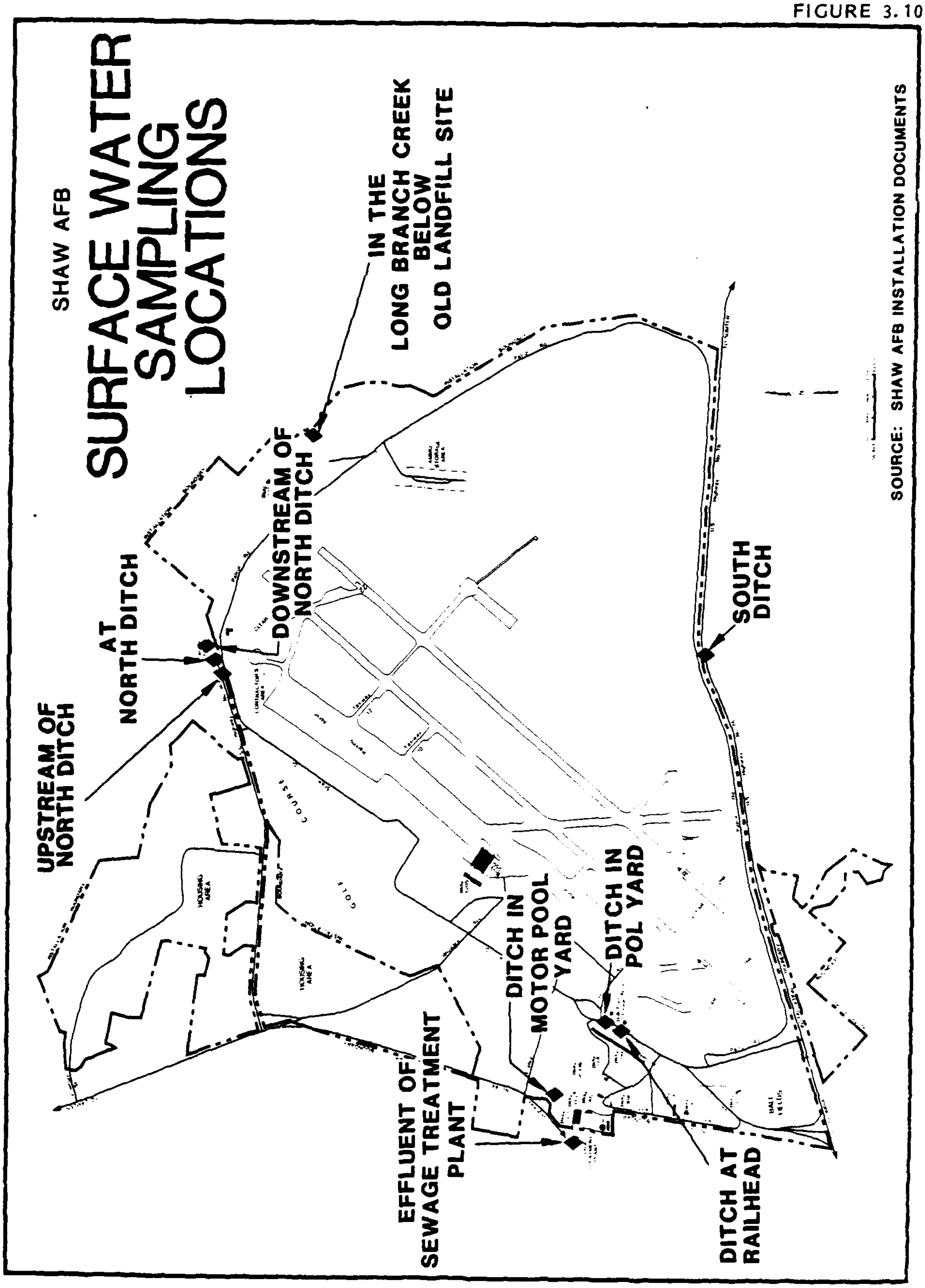
All surface water drainage from Shaw AFB eventually flows to the Pocataligo River via intermediary creeks such as Long Branch Creek. Effluent from the sewage treatment plant is piped 4370 feet to Beech Creek which empties into Wateree Swamp. The characteristics of the sewage treatment plant are discussed in detail in Chapter 4. Long Branch Creek, the Pocataligo River and Beech Creek are all considered acceptable Class B water, by the State of South Carolina. Quality standards for Class B waters include specific requirements pertaining to dissolved oxygen, fecal coliforms, pH, temperature, color and other deleterious substances or toxic wastes.

A routine monthly monitoring program has been conducted by the base Bioenvironmental Engineering Services. The program involves monitoring drainage ditches, creeks and the influent and effluent of the sewage treatment plant. Eight sampling stations were established along the ditches and creeks on and in the vicinity of Shaw AFB (Figure 3.10). Data collected over the past five years have been summarized in Appendix D, Tables D.5 through D.10. The results of the pollution monitoring shows the water leaving Shaw AFB is within the standards, except for an occasional problem with phenol. The decreased usage of phenol-containing products is expected to alleviate this problem.

BIOTIC ENVIRONMENT

Shaw AFB is comprised of 827 acres of improved grounds, 1,012 acres of semi-improved grounds and 778 acres of unimproved grounds. The

FIGURE 3.10



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remaining 719 acres of the installation are beneath buildings, roads, parking and airfield pavements. The improved grounds typically support perennial vegetative cover composed of common bermuda grass, carpet lespedeza, centipede and bahaia. Semi-improved grounds also consist of common bermuda grass and perennial poor soil weeds. The unimproved grounds are primarily comprised of wooded areas supporting pine trees and 555 acres are under forestry management.

No unique natural areas exist on base. There are no reports of any threatened or endangered plants or animal species on the base.

SUMMARY OF ENVIRONMENTAL SETTING

The environmental setting data reviewed for this investigation indicate the following major points that are relevant to the evaluation of past hazardous waste management practices at Shaw Air Force Base:

- The mean annual precipitation is 45.8 inches and mean net precipitation is calculated to be three inches.
- Surface soils of the Shaw Air Force Base area are typically sandy, moderately permeable and possess shallow water levels (twenty feet or less).
- Tertiary and Quaternary sediments forming the shallow aquifer system are present at Shaw AFB, either exposed or very near ground surface. These deposits are considered to be components of an important local aquifer from which Shaw AFB obtains a part of its water supplies. The base is located within what is probably a recharge zone for the shallow aquifer.
- Little runoff leaves the study area; flooding is not known to be a serious problem. It is suspected that most rainfall becomes recharge to the shallow aquifer.
- The two major regional aquifers present in the study area are the Black Creek and Middendorf (Tuscaloosa) systems. It is not known if the Black Creek is separated from the shallow system. The Black Creek is known to be separated from the underlying Middendorf.
- Local ground-water resources are of generally good quality, however, local variations in quality are known to be caused by aquifer conditions.

- Base surface waters are of generally good quality.
- No threatened or endangered species have been observed within Shaw AFB boundaries.

From these major points, it may be seen that potential pathways for the migration of hazardous waste-related contamination exist. If uncontained hazardous materials are present in or on the ground surfaces they may encounter the shallow aquifer. Further, migration to the intermediate (Black Creek) aquifer may be induced by large withdrawals from this unit such as those created by base wells. Due to the separation of the Black Creek and the underlying Middendorf, contamination of the lower regional aquifer is considered remote.

CHAPTER 4

FINDINGS

CHAPTER 4
FINDINGS

To assess hazardous waste management at Shaw Air Force Base, past activities of waste generation and disposal methods were reviewed. This chapter summarizes the hazardous waste generated by activity; describes waste disposal methods; identifies the disposal sites located on the base; and evaluates the potential for environmental contamination. An additional section has been included in this chapter which describes the Poinsett Aircraft Range and discusses the areas of potential contamination found within the range.

PAST SHOP AND BASE ACTIVITY REVIEW

To identify past base activities that resulted in generation and disposal of hazardous waste, a review was conducted of current and past waste generation and disposal methods. This activity consisted of a review of files and records, interviews with base employees, and site inspections.

The source of most hazardous wastes on Shaw AFB can be associated with one of the following activities:

- Industrial shops
- Fire protection training
- Pesticide utilization
- Heat and power production
- Fuels management
- Defense Property Disposal Office (DPDO) storage

The following discussion addresses only those wastes generated on Shaw AFB which are either hazardous or potentially hazardous. In this discussion a hazardous waste is defined as hazardous by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) or by South Carolina regulations concerning hazardous waste.

A potentially hazardous waste is one which is suspected of being hazardous, although insufficient data are available to fully characterize the waste material.

Industrial Operations (Shops)

Since the early 1940's, industrial operations (shops) at Shaw AFB have included maintenance activities to support aircraft flying missions. These shops maintained, fabricated and repaired components and parts of aircraft and ground equipment. A list of past and present industrial shops was obtained from the Bioenvironmental Engineering Services (BES) files. Information contained in the files indicated those shops which generate hazardous waste and/or handle hazardous materials. A summary review of the shop files is shown in Appendix E, Master List of Industrial Shops.

For those shops that generated hazardous waste, key personnel within the base maintenance support functions were interviewed. A timeline of disposal methods was established for major wastes generated. The information from interviews with base personnel and base records has been summarized in Table 4.1. This table presents a list of building locations as well as the waste material names, waste quantities, and disposal method timeline. Many of the disposal methods were identified from information obtained from personnel currently at the base. The waste quantities shown in Table 4.1 are based on verbal estimates given by shop personnel at the time of the interviews. The shops that have generated insignificant quantities or no hazardous waste are not listed in Table 4.1.

From the time operations began at the base (1941) until the mid-1960's, most combustible wastes generated at the various facilities throughout the base were brought in drums to Fire Protection Training Area No. 1 and burned by the fire department during routine training exercises. Small quantities of chemical wastes may also have entered the landfills in use during this period. From the mid-1960's until 1981, chemical wastes (i.e., solvents and cleaning solutions) and waste petroleum products were typically stored at the generators site and contracted out for off-base disposal. During this period, both Base Civil Engineering and DPDO shared in arranging for off-base contract disposal of these wastes. DPDO primarily coordinated the contracting for the removal of waste petroleum products. Since 1980, most hazardous

TABLE 4.1

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (Bldg. No.)	WASTE MATERIAL (Current Usage)	WASTE QUANTITY (Current Usage)	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL (1950 – 1960 – 1970 – 1980)
363 TRANSPORTATION SQUADRON				
WHEEL/TIRE/BATTERY SHOP	325 (formerly in S-8)	BATTERY ACID	100 GALS./MO.	1942 NEUTRALIZED TO SANITARY SEWER
		WASTE BATTERIES	20 BATT./MO.	DPDO
		WASTE OIL	150 GALS./MO.	FIRE PROTECTION TRAINING NO. 1; CONTRACTOR
		HYDRAULIC FLUIDS	50 GALS./MO.	FIRE PROTECTION TRAINING NO. 1; CONTRACTOR
		OLD BATTERIES	10-15/MO.	DPDO
REFUELING MAINTENANCE SHOP	118	WASTE OIL	200 GALS./MO.	FIRE PROTECTION TRAINING NO. 1; CONTRACTOR
		WASTE FUEL (JP-4, Mogas, Avgas and Diesel)	200 GALS./MO.	FIRE PROTECTION TRAINING NO. 1; CONFINED TO OIL/WATER SEPARATOR; SEGREGATED IN DRUMS, DPDO
363 COMPONENT REPAIR SQUADRON				
ELECTRIC SHOP	1205 (formerly in S 174)	BATTERY ACID	80 GALS./MO.	NEUTRALIZED TO SANITARY SEWER
		WASTE BATTERIES	12 BATT./MO.	DPDO
		SYNTHETIC OIL	40 GALS./MO.	FIRE PROTECTION TRAINING NO. 1; 1960; CONTRACTOR
		OLD BATTERIES	5-10/MO.	STOCKPILED OUTSIDE, TO DPDO; STOCKPILED INSIDE, TO DPDO
PNEUDRAULICS SHOP	1205	HYDRAULIC FLUID	10 GALS./MO.	1948 FIRE PROTECTION TRAINING NO. 1; CONTRACTOR
		PD-680	ESTIMATE NOT AVAILABLE	FIRE PROTECTION TRAINING NO. 1; CONTRACTOR

KEY

——— CONFIRMED TIME FRAME DATA BY SHOP PERSONNEL

- - - - - ESTIMATED TIME FRAME

TABLE 4.1 (cont'd)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (Bldg. No.)	WASTE MATERIAL (Current Usage)	WASTE QUANTITY (Current Usage)	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL 1950 1960 1970 1980
363 COMPONENT REPAIR SQUADRON (cont'd)				
JET/RECIP ENGINE SHOP	1207	WASTE OIL	50 GALS./MO.	1942 FIRE PROTECTION TRAINING NO. 1; CONTRACTOR
		ALKALINE SOAP	15 GALS./MO.	DILUTED/TO SANITARY SEWER
		PD-680	100 GALS./YR.	FIRE PROTECTION TRAINING NO. 1; CONTRACTOR
TEST CELL	1708	WASTE OIL	50 GALS./MO.	1950 FIRE PROTECTION TRAINING NO. 1; CONTRACTOR
		PD-680	10 GALS./MO.	OIL/WATER SEPARATOR TO SURFACE DISCHARGE; 1980 CONTRACTOR
363 TACTICAL FIGHTER WING				
MOBILE PHOTOLAB	(MOBILE)	PHOTO CHEMICALS	100 GALS./DAY	1960 SANITARY SEWER
		SILVER RECOVERY CARTRIDGES	15/2 MOS.	1978 DPDO
363 EQUIPMENT MAINTENANCE SQUADRON				
AEROSPACE GROUND EQUIPMENT SHOP	1602	HYDRAULIC FLUID	150 GALS./MO.	ABOVE-GROUND TANK, FIRE PROTECTION TRAINING NO. 1; ABOVE GROUND TANK, CONTRACTOR
		WASTE OIL	350 GALS./MO.	ABOVE-GROUND TANK, FIRE PROTECTION TRAINING NO. 1; ABOVE GROUND TANK, CONTRACTOR; BELOW-GROUND TANK, CONTRACTOR
		SYNTHETIC OIL	400 GALS./MO.	ABOVE-GROUND TANK, FIRE PROTECTION TRAINING NO. 1; ABOVE GROUND TANK, CONTRACTOR
WHEEL AND TIRE SHOP	1200	PD 680	100 GALS./MO.	FIRE PROTECTION TRAINING NO. 1; CONTRACTOR
		WASTE OIL	55 GALS./MO.	FIRE PROTECTION TRAINING NO. 1; CONTRACTOR

KEY

——— CONFIRMED TIME FRAME DATA BY SHOP PERSONNEL

- - - - - - ESTIMATED TIME FRAME

TABLE 4.1 (cont'd)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (Bldg. No.)	WASTE MATERIAL (Current Usage)	WASTE QUANTITY (Current Usage)	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL (1950 – 1960 – 1970 – 1980)
363 EQUIPMENT MAINTENANCE SQUADRON (cont'd)				
EGRESS SHOP	1205	PD-680	1-10 GALS. /MO.	1942 DRUMMED, TO DPDO
		ENAMEL	1-10 GALS. /MO.	DRUMMED, TO DPDO
CORROSION CONTROL	1511	THINNERS	20 GALS. /MO.	FIRE PROTECTION TRAINING NO. 1; 1969 OIL/WATER SEPARATOR
		PD-680 AND OTHER SOLVENTS	150 GALS. /MO.	FIRE PROTECTION TRAINING NO. 1; 1969 OIL/WATER SEPARATOR
		WASHRACK EFFLUENT SOLVENTS	ESTIMATE NOT AVAILABLE	OIL/WATER SEPARATOR OIL TO CONTRACTOR, WATER TO NORTH DITCH; 1980 UNUSED
		PAINTS	20 GALS. /MO.	OIL/WATER SEPARATOR OIL TO CONTRACTOR, WATER TO NORTH DITCH
USAF HOSPITAL				
DENTAL X RAY LABORATORY	1046	PHOTO CHEMICALS	ESTIMATE NOT AVAILABLE	1973 SANITARY SEWER
HISTOPATHOLOGY LABORATORY	1048	XYLENE	5-10 GALS. /YR.	1948 DPDO 1980
		HISTOSOL	5-10 GALS. /YR.	DPDO
MEDICAL X-RAY LABORATORY	1048	PHOTO CHEMICALS	4 PKGS. /MO.	SANITARY SEWER
		SILVER RECOVERY CARTRIDGES	5 LBS. /MO.	1978 DPDO
CLINICAL LABORATORY	1048	WRIGHT GIEMSA STAIN	ESTIMATE NOT AVAILABLE	SANITARY SEWER

KEY

——— CONFIRMED TIME FRAME DATA BY SHOP PERSONNEL

- - - - - - ESTIMATED TIME FRAME

TABLE 4.1 (cont'd)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (Bldg. No.)	WASTE MATERIAL (Current Usage)	WASTE QUANTITY (Current Usage)	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL 1950 1960 1970 1980
363 COMBAT SUPPORT GROUND				
BASE PHOTO LAB	404 (formerly in 555)	PHOTO CHEMICALS	ESTIMATE NOT AVAILABLE	1942 SANITARY SEWER
		SILVER RECOVERY CARTRIDGES	<10/MO.	1978 DPDO
FIRING RANGE	1846	PD-680	1 GAL. /MO.	CONTRACTOR; UNUSED
		RIF CLEANER	1 GAL. /MO.	1980 DPDO
MWR ARTS AND CRAFTS	822	PHOTO CHEMICALS	25 GALS. /MO.	SANITARY SEWER
		SILVER RECOVERY CARTRIDGES	<2/MO.	DPDO
AUTO HOBBY SHOP	1031	WASTE OIL	250 GALS. /MO.	FIRE PROTECTION TRAINING NO. 1; CONTRACTOR
		STEAM CLEANING CONDENSATE	ESTIMATE NOT AVAILABLE	FLOOR DRAIN TO RUNOFF; DRAIN TO OIL/WATER SEPARATOR TO SANITARY SEWER
AERO CLUB	116	WASTE OIL	25 GALS. /MO.	FIRE PROTECTION TRAINING NO. 1; CONTRACTOR; OFF-BASE REUSE
363 CIVIL ENGINEERING SQUADRON				
HEATING PLANT	403	CAUSTIC	3 LBS. /MO.	DILUTE TO SANITARY SEWER
		PHOSPHATE	3 LBS. /MO.	DILUTE TO SANITARY SEWER
ENTOMOLOGY SHOP	315 (before 1973 located in 308)	CANISTER RINSING	ESTIMATE NOT AVAILABLE	RUNOFF; SANITARY SEWER
		EMPTY PESTICIDE CONTAINERS	10-20 /MO.	RINSE, TO ON-BASE LANDFILL; TRIPLE RINSE TO REFUSE

KEY

——— CONFIRMED TIME FRAME DATA BY SHOP PERSONNEL

- - - - - - ESTIMATED TIME FRAME

TABLE 4.1 (cont'd)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (Bldg. No.)	WASTE MATERIAL (Current Usage)	WASTE QUANTITY (Current Usage)	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL 1950 1960 1970 1980
363 CIVIL ENGINEERING SQUADRON (cont'd)				
POWER PRODUCTION SHOP	313	BATTERY ACID	10-20 GALS./MO.	1942 SANITARY SEWER; NEUTRALIZATION PIT TO SANITARY SEWER
		WASTE OIL	150 GALS./MO.	FIRE PROTECTION TRAINING NO. 1; CONTRACTOR
		DIESEL OIL	1-5 GALS./MO.	CONTRACTOR
507 TACTICAL AIR CONTROL CENTER				1954
CORROSION CONTROL SHOP	T-29	PAINT	1-5 GALS./MO.	FIRE PROTECTION TRAINING NO. 1; CONTRACTOR
		TOLUENE	25 GALS./MO.	FIRE PROTECTION TRAINING NO. 1; CONTRACTOR
AGE MAINTENANCE SHOP	T-28	JP-4	10-50 GALS./MO.	FIRE PROTECTION TRAINING NO. 1; CONTRACTOR
		HYDRAULIC FLUIDS	250 GALS./MO.	FIRE PROTECTION TRAINING NO. 1; CONTRACTOR
VEHICLE MAINTENANCE SHOP	T-19	WASTE OIL	50 GALS./MO.	FIRE PROTECTION TRAINING NO. 1; CONTRACTOR
682 DIRECT AIR SUPPORT CENTER SQUADRON				
AGE MAINTENANCE	1852	HYDRAULIC FLUID	15 GALS./MO.	FIRE PROTECTION TRAINING NO. 1; CONTRACTOR
		WASTE OIL	25 GALS./MO.	FIRE PROTECTION TRAINING NO. 1; CONTRACTOR
VEHICLE MAINTENANCE	1852	WASTE OIL	50 GALS./MO.	FIRE PROTECTION TRAINING NO. 1; CONTRACTOR

KEY

——— CONFIRMED TIME FRAME DATA BY SHOP PERSONNEL

- - - - - ESTIMATED TIME FRAME

TABLE 4.1 (cont'd)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (Bldg. No.)	WASTE MATERIAL (Current Usage)	WASTE QUANTITY (Current Usage)	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL 1950 1960 1970 1980
4507 CONSOLIDATED AIRCRAFT MAINTENANCE SQUADRON				
HELICOPTER MAINTENANCE SHOP	1211	JP-4	100 GALS. /MO.	1955 FIRE PROTECTION TRAINING NO. 1 → CONTRACTOR
		SYNTHETIC OIL	100 GALS. /MO.	FIRE PROTECTION TRAINING NO. 1 → CONTRACTOR
		PD-680	20 GALS. /MO.	FIRE PROTECTION TRAINING NO. 1 → CONTRACTOR
FABRICATION/CORROSION CONTROL SHOP	611	WASTE OIL	200 GALS. /MO.	FIRE PROTECTION TRAINING NO. 1 → CONTRACTOR
		THINNERS	25 GALS. /MO.	FIRE PROTECTION TRAINING NO. 1 → CONTRACTOR
		PD-680	100 GALS. /YR.	FIRE PROTECTION TRAINING NO. 1 → CONTRACTOR
		PAINTS	2-5 GALS. /MO.	FIRE PROTECTION TRAINING NO. 1 → CONTRACTOR
AGE SHOP	1212	PD-680	20-50 GALS. /MO.	FIRE PROTECTION TRAINING NO. 1 → CONTRACTOR
		LUBE OIL	50 GALS. /MO.	FIRE PROTECTION TRAINING NO. 1 → CONTRACTOR

KEY

——— CONFIRMED TIME FRAME DATA BY SHOP PERSONNEL

- - - - - - ESTIMATED TIME FRAME

wastes, with the exception of used oils, have been delivered to DPDO for disposal. Used oil is temporarily stored in drums and tanks situated throughout the base prior to removal by contractors for off-base disposal.

Fire Protection Training

The Fire Department has operated three fire protection training areas (FPTA) since the activation of Shaw AFB. The following list gives specific designations for these areas and identifies their approximate period of use. Figure 4.1 depicts their location.

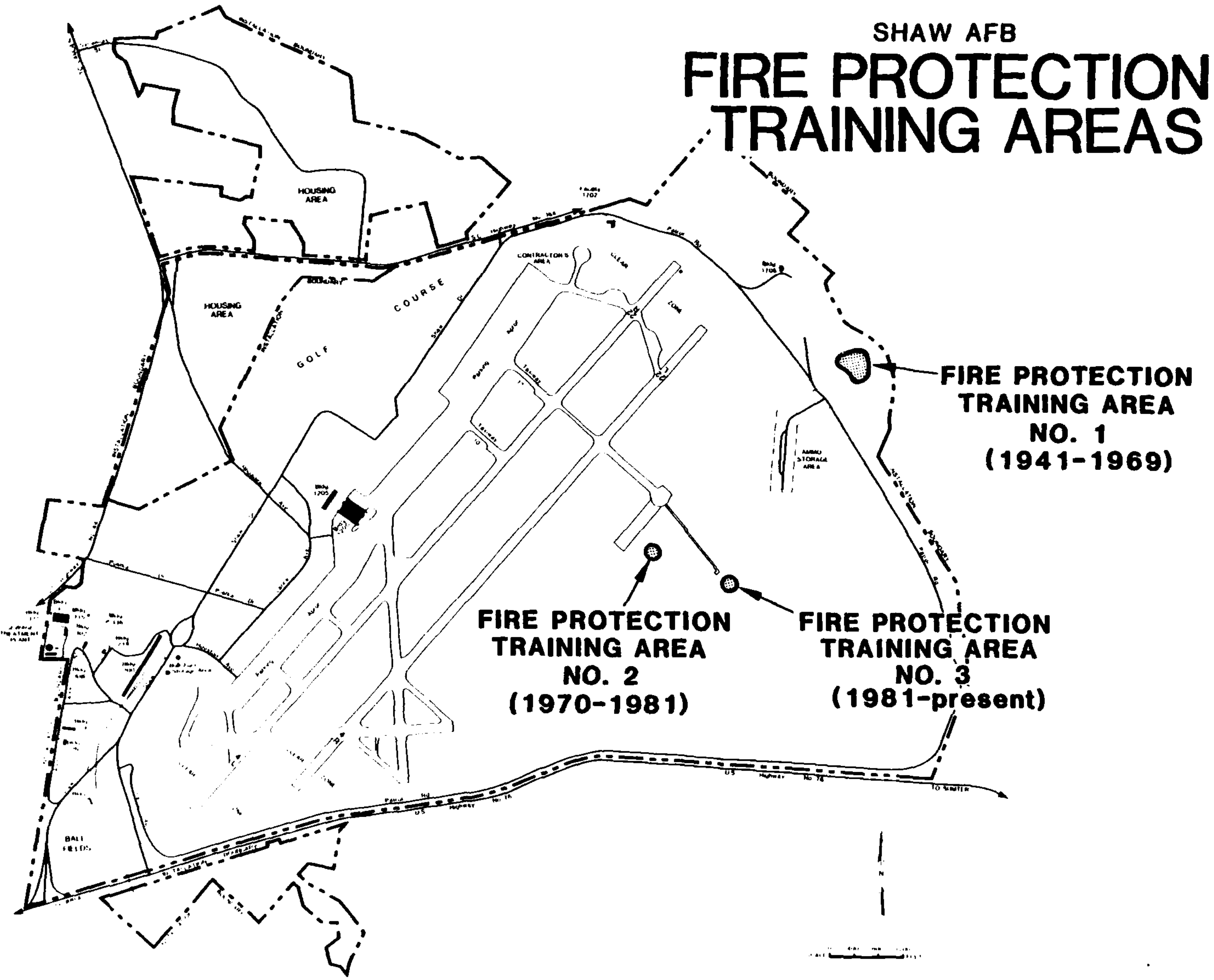
Fire Protection Training Areas	Period of Operation
No. 1	1941-1969
No. 2	1970-1981
No. 3	1981 - Present

Fire Protection Training Area No. 1

From approximately 1941 until 1969, the Fire Department conducted fire protection training exercises within a 3.5 acre area located in the northeast sector of the base across the perimeter road from the ammo storage area (Fire Protection Training Area No. 1). The site is comprised of sandy soils. Burning was conducted throughout the area on different occasions during this period. Close examination revealed discolored, charred soils covering the entire area. The site now supports a sparse vegetative cover.

From 1941 until the mid-1960's, various types of combustible waste chemicals generated at the base were brought to this area in 55-gallon drums and burned during routine training exercises, typically conducted on a weekly basis. These materials were reported to have included waste oils, waste Avgas and jet fuel, hydraulic fluid, spent solvents and even napalm on occasions. The burn area did not have a liner system nor was there any pre-application of water to prevent the percolation of the waste chemicals into the soil. The materials were applied directly to the soil and ignited. Participants in the operation reported that the liquid wastes would typically soak into the sandy soils. The extinguishing agents used during the period included CO_2, protein foam and

SHAW AFB
FIRE PROTECTION TRAINING AREAS



SOURCE: SHAW AFB INSTALLATION DOCUMENTS

water. Some aqueous film forming foam (AFFF) was used as an extinguishing agent during the later period of use. It was reported that many of the empty drums used for transporting the combustible materials were buried in shallow pits within the fire training area. From the mid-1960's until 1969 only JP-4 was burned during the training exercises.

Fire Protection Training Area No. 2

In 1970, the fire protection training area described above was relocated to an open grassy area on the east side of the main runway (Fire Protection Training Area No. 2). This area was utilized for training exercises between 1970 and 1981. A visit to the area revealed an unlined, circular training pit approximately 100 feet in diameter with a 1.5 foot berm along the perimeter of the pit. The soil within the pit is of a sandy clay composition. The crust of the soil was discolored due to the burning that occurred in the pit. Rain occurred one day prior to the site inspection and some ponding of water within the bermed area was still evident. JP-4 was the only fuel used at this site. Exercises were conducted on a monthly basis and would utilize 300 to 1000 gallons of fuel. Water was applied to the pit prior to the application of fuel to reduce the amount of fuel percolation into the soil. AFFF and water were generally used as extinguishing agents. The site was not equipped with any system for collecting or treating the runoff from the training operations.

Fire Protection Training Area No. 3

A new fire protection training area was constructed and put into operation in 1981 (Fire Protection Training Area No. 3). At that time, the use of FPTA No. 2 was discontinued. FPTA No. 3 is located approximately 1,200 feet east of FPTA No. 2. The new training area was constructed over compacted soil. The pit is approximately 75 feet in diameter and is surrounded by a two-foot berm. A drain has been installed in the center of the pit to direct the contaminated water to a nearby underground oil/water separator. The oil/water separator is routinely inspected and pumped on an as-needed basis. Discharge from the oil/water separator is directed to an underground tile field. The new fire protection training area is operated in a similar manner to that described under FPTA No. 2.

Pesticide Utilization

Pest management has been conducted at Shaw AFB by the Civil Engineering Squadron since the base was constructed. Herbicide applications were performed by the Pavements and Grounds Shop until 1978 at which time these responsibilities were transferred to the Entomology Shop. The pest management program entails routine and specific-job-order chemical application and spraying. No aerial spraying has been conducted at Shaw AFB. The pesticides are presently stored at the Entomology Shop (Bldg. 315). Prior to 1973, the Entomology Shop was located in Bldg. 308. Pesticides on-hand at the time of this study are listed in Appendix D, Table D.1.

Prior to 1976, empty pesticide containers were disposed of in the on-base sanitary landfills. During this period, the empty containers were usually rinsed and punctured before disposal. In 1976, standard procedures were implemented to triple rinse and puncture the empty containers prior to disposal with domestic refuse.

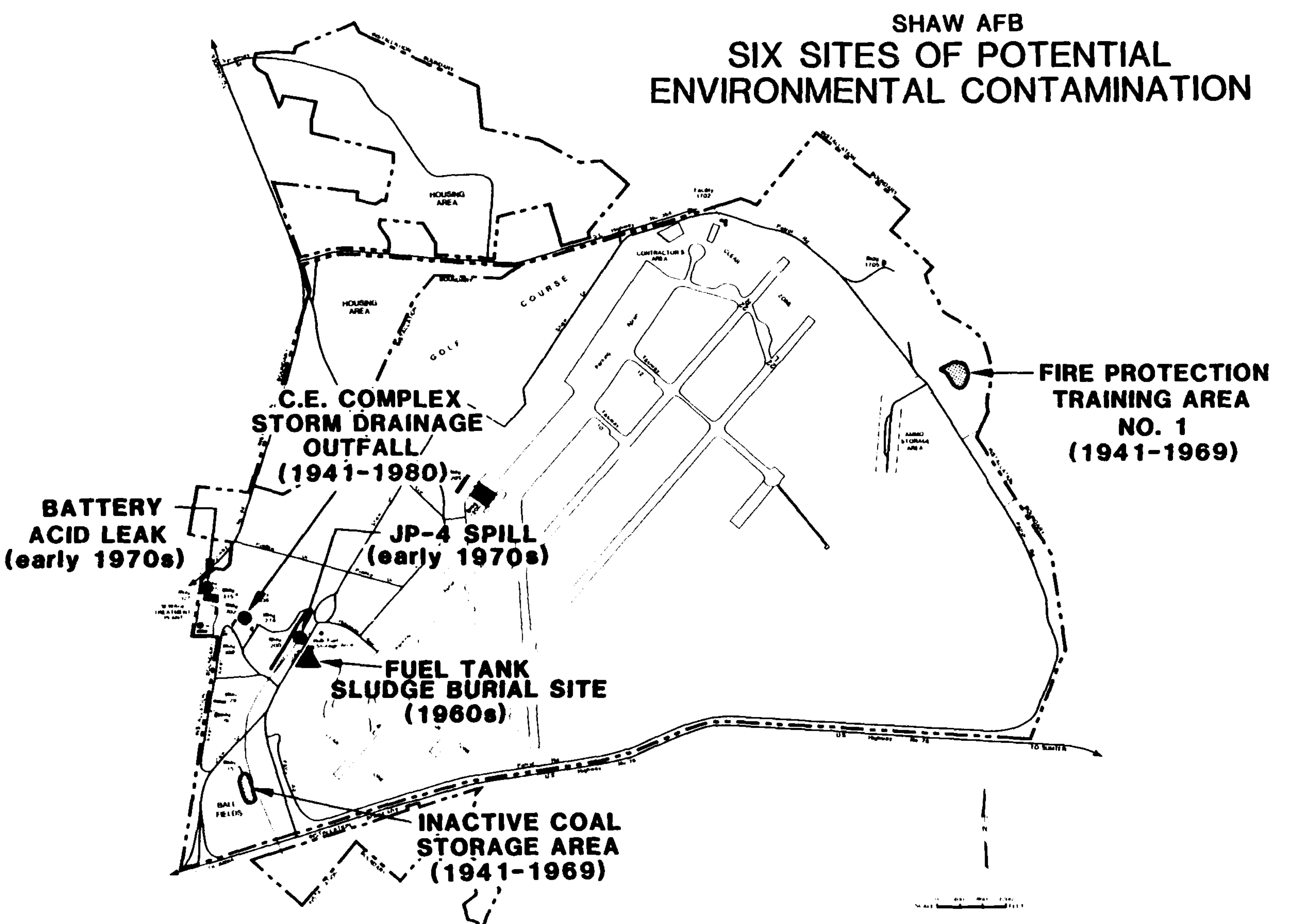
Rinsing of equipment and empty containers was performed in areas adjacent to the Entomology Shops (see Figure 4.2). The rinsate was allowed to run off into the storm drainage system. In 1980, a washrack and holding tank were constructed adjacent to Bldg. 315. All rinsing of containers and equipment has been conducted over the washrack. The overflow from the holding tank has been discharged to the sanitary sewer system. No significant pesticide spills have occurred at Shaw AFB.

Fuels Management

The Shaw AFB Fuels Management Storage System consists of a number of above-ground and underground storage tanks located throughout the base. A listing of the locations of the fuel storage tanks and their products and capacities has been provided in Appendix D, Table D.2. Fuels stored at Shaw AFB include: JP-4, Avgas, Mogas, diesel fuel, fuel oil No. 2 and contaminated fuels and used oils. JP-4 and Avgas arrive on base primarily by rail. Tanker trucks are used as a backup delivery method for these fuels and as the primary method of delivery for all other fuels used on base.

The JP-4 is stored in the bulk storage area in two above-ground storage tanks (approximately 700,000 gallons and 500,000 gallons) and several underground tanks. Each of the above-ground tanks is encircled

SHAW AFB
SIX SITES OF POTENTIAL ENVIRONMENTAL CONTAMINATION



SOURCE: SHAW AFB INSTALLATION DOCUMENTS

by a dike that will hold the tank capacity plus one foot freeboard. Fuel oil, Avgas, Mogas, and diesel fuel are all stored in underground tanks. Additionally, JP-4 is stored in underground tanks which are associated with the hydrant refueling system located along the flightline. Fuel is delivered to aircraft in two manners: direct from the bulk storage area via refueling trucks and by means of the underground hydrant refueling system constructed in 1953.

The fuel offloading facility, storage tanks and hydrant systems are maintained by the Civil Engineering Squadron's Liquid Fuels Maintenance Shop. The systems undergo routine inspection. No leakage from the tanks or underground piping has been reported.

Fuel storage tanks are cleaned on an as-needed basis. The sludge accumulated from tank cleaning operations is known to have been disposed of in three manners: (1) weathered and buried in the area previously used as Fire Protection Training Area No. 1 (Figure 4.1); (2) weathered and buried in a shallow pit located in the southwest corner of the bulk fuel storage area (Figure 4.2); and (3) drummed and disposed of off base. The actual dates when these procedures were implemented are uncertain. However, it is suspected that fuel sludge was burned during fire training exercises in the 1940's and 1950's. In the early 1960's, the sludge was reported to have been buried in the pit located in the bulk fuel storage area. From the mid 1960's, until the mid 1970's, the sludge was reported to have been buried at Fire Protection Training Area No. 1. Tanks have not been cleaned since the mid-1970's.

Spills

Small fuel spills have occurred in several areas throughout the base. The spills are generally attributed to fuel transfer and aircraft refueling operations. They typically occur on paved areas and evaporate or are immediately cleaned up. No significant environmental contamination is attributed to these spills.

The only large fuel spills which were reported to have occurred at Shaw AFB were attributed to offloading operations at the railhead directly west of the bulk fuel storage area. Several minor spills were reported to have occurred in this area during the 1950's. The largest spill reported in the area involved the rupturing of a tank car valve in

the early 1970's (Figure 4.2). It was estimated that several thousand gallons of JP-4 were released and discharged to the drainage system along Shaw Drive. The JP-4 either evaporated or seeped into the ground. No fuel left the base property.

No significant chemical spills have been reported at Shaw AFB. During the early 1970's, a water supply pipeline failed in an area traversing the motor pool (adjacent to Bldg. 327, Figure 4.2). The probable cause of the pipe failure was corrosion due to acid leakage from a battery storage area. A ten-foot section of cement asbestos was replaced. Soil samples were not collected from the area to determine the acidity of the soil. During a recent visit to the site, no indication of any spillage was evident. The area is covered by grass and batteries are no longer stored in the area.

Heat and Power Production

Shaw AFB has been equipped with centralized heating and power plants since the base was initially constructed. Until approximately 1960, the heating plants were primarily fueled by coal. However, some of the outlying facilities and the housing area were individually heated by fuel oil or natural gas. By 1969, all use of coal was phased out and the large boiler units were converted to fuel oil. No significant leaks or spills associated with the use of fuel oil are known to have occurred.

During the period the base burned coal, the coal storage pile was located in the southwest corner of the base (adjacent to the base ballfields, Figure 4.2). The coal was stored on the ground with no cover. Since coal usage has been discontinued, the area has been cleaned and no evidence of coal residuals is apparent. No surface drainage ditches are located in the immediate vicinity of the storage area. Coal ash was disposed of in the on-base landfills which were in use during the period the base was burning coal.

DESCRIPTION OF PAST ON-BASE TREATMENT AND DISPOSAL METHODS

The facilities on Shaw AFB which have been used for the management and disposal of waste can be categorized as follows:

- Landfills
- Hardfills

- Fire Protection Training Area No. 1
- Waste Storage Areas
- Septic Tanks
- Sewage Treatment System and Sludge Landfarm
- Storm Drainage System

Landfills

Three landfills used for the disposal of refuse were identified at Shaw AFB. Landfill locations have been identified on Figure 4.3 and a summary of pertinent information concerning each landfill has been presented in Table 4.2. Four hardfill disposal sites are also identified on Figure 4.3.

Landfill No. 1

Landfill No. 1 is located on the northern side of the base in an area which is now used as offices and storage for the on-base disposal contractors (Figure 4.4). The landfill is less than two acres and was used between 1941 and 1945 for disposal of all general refuse generated on the base during this period. The wastes were placed in trenches (20 to 30 feet deep and 15 to 20 feet wide) and burned before cover material was added. Only small quantities of waste chemicals and petroleum products are suspected to have been disposed of in this landfill.

Landfill No. 2

Landfill No. 2 is also located on the northern side of the base approximately 600 feet east of Landfill No. 1, near facility 1702 (Figure 4.4). The site comprises less than 0.5 acres and was used during 1945 for less than one year due to the high water table in the area causing water to enter the trenches. The trenches were reported to have been less than 20 feet deep. Only general refuse was disposed of in this area. The refuse was burned prior to covering. Small quantities of waste chemicals and petroleum products may have been disposed of in this landfill. The landfill has been closed. Cover material consists of natural soils which support local vegetation.

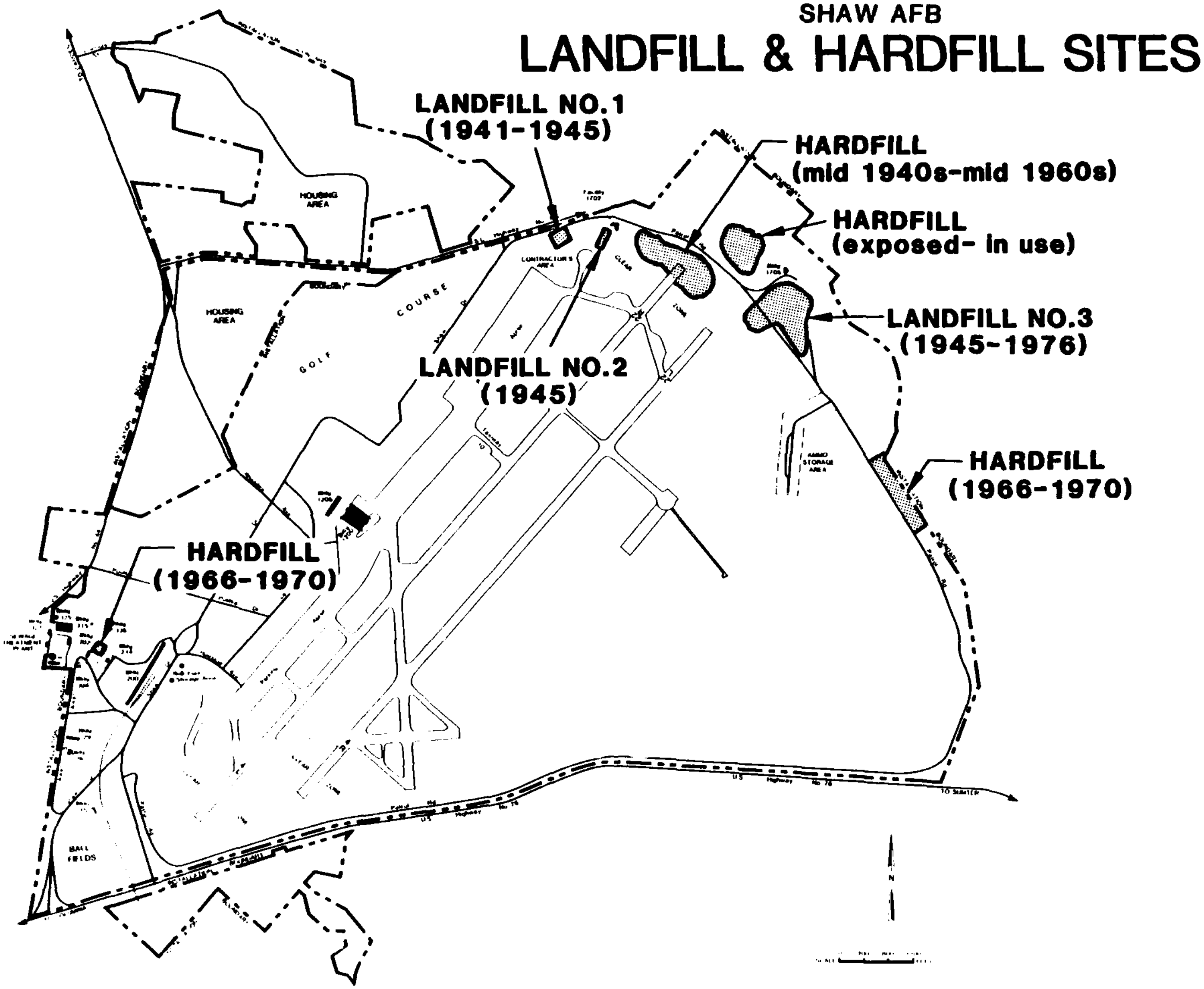
Landfill No. 3

Landfill No. 3 is the largest sanitary landfill on Shaw AFB. The site encompasses approximately 15 acres located on the north side of the main runway (Figure 4.5). General refuse generated on base between 1945 and 1976 was disposed of in this area. Until the early 1960's, wastes

FIGURE 4.3

SHAW AFB

LANDFILL & HARDFILL SITES



SOURCE: SHAW AFB INSTALLATION DOCUMENTS

TABLE 4.2
SUMMARY OF LANDFILL DISPOSAL SITES

Landfill	Operation Period	Approximate Size (Acres)	Depth (feet)	Type of Waste	Estimated Waste Quantity (Cu. Yd.)	Method of Operation	Closure Status	Surface Drainage
Landfill No. 1	1941-1945	<2	20-30	General Refuse	40,000	Trench and fill, daily burning	Closed used as contractor storage area.	To Long Branch Creek
Landfill No. 2	1945	<0.5	<20	General Refuse	<20,000	Trench and fill, daily burning	Closed, earth covered with grass established.	To Long Branch Creek
Landfill No. 3	1945-1976	15	12	General Refuse	200,000	Trench and fill, daily burning until early 1960's.	Closed, earth cover, some grass established. Ponding occurring on surface. No leachate observed.	To Long Branch Creek

FIGURE 4.4

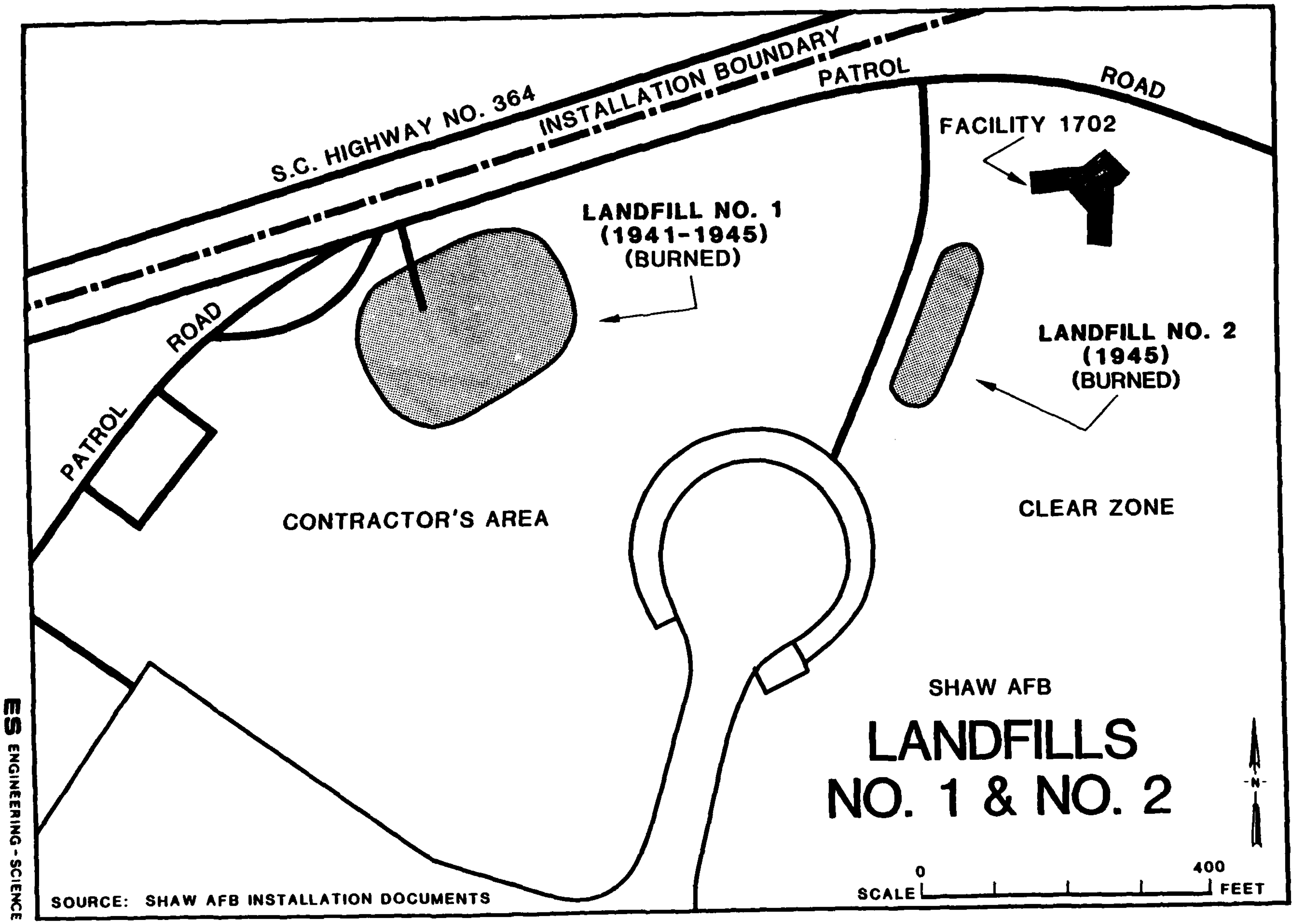


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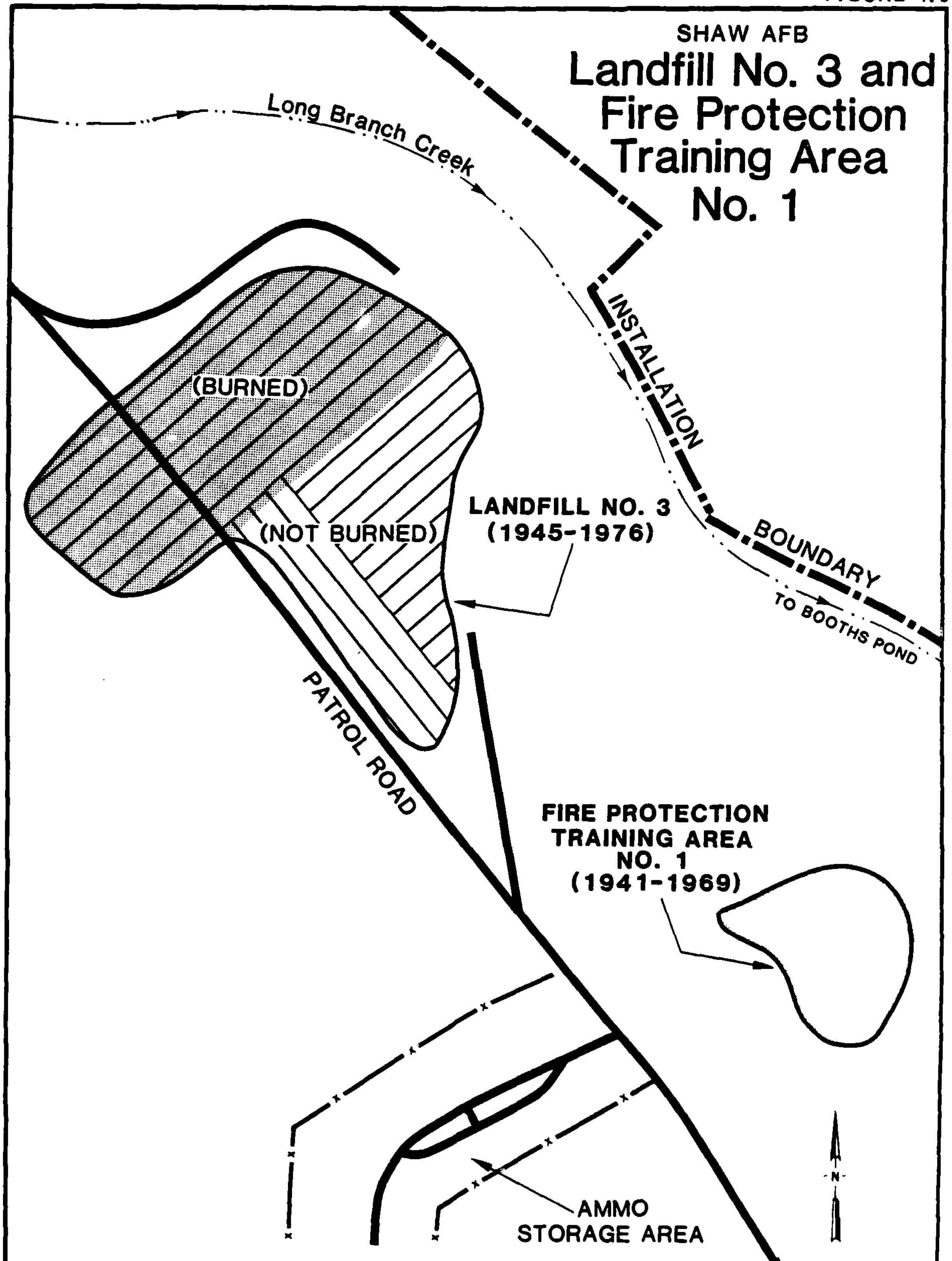
FIGURE 4.5



NOTE: LINES WITHIN LANDFILL INDICATE TRENCH ORIENTATION

SOURCE: SHAW AFB INSTALLATION DOCUMENTS

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were burned in trenches approximately 12 feet deep and then covered. When burning practices were discontinued due to air quality constraints, the wastes were covered on a daily basis. As can be seen in Figure 4.5, the western side of the landfill was burned and the eastern portion of the landfill was not. Small quantities of industrial chemicals and petroleum products are suspected of having been buried in the landfill. During a recent site visit, it was noted that the majority of the landfill is covered by grassy vegetation; however, some exposed soils with slight depressions which collect water still exist on part of the landfill. Long Branch Creek is located on the north side of the landfill. No surface leachate was observed during the site visit.

Hardfill Areas

Four hardfill areas are known to exist on the base. These areas have been identified in Figure 4.3. One area located north of the main runway is still accepting wastes. Several types of non-putriscible wastes are disposed of in these areas. They include primarily construction rubble (i.e., concrete, bricks, wood and scrap metal) and landscaping wastes. No wastes which can cause any contamination problems are known to have been disposed of in these areas.

Fire Protection Training Area No. 1

The Fire Department burned substantial amounts of industrial chemicals and waste petroleum products in FPTA No. 1 (Figure 4.5) during fire protection training exercises which were conducted between 1941 and the mid-1960's. A detailed discussion of the procedures used was presented earlier in this chapter.

Waste Storage Areas

Waste chemicals and used oils have been stored in several areas throughout the base. In most cases, the wastes have been temporarily stored at the site of generation until the wastes were removed for final disposal. There are however, two central collection points for waste oils and solvents - Bldg. 20 and Bldg. 1200. The Defense Property Disposal Office (DPDO) storage yard has also been used since 1981 as a site for storing waste chemicals considered to be hazardous. No significant spills have occurred in any of these areas.

Out-of-service transformers containing polychlorinated biphenyls (PCBs) or PCB-contaminated oils (presently 3 transformers) awaiting disposal are being stored in the exterior electric storage yard (adjacent to Building 322). One PCB-contaminated transformer was previously stored at the supply open storage yard (Building 214) and was disposed of by DPDO. No PCB spills have occurred in either of these areas.

Septic Tanks

There are four septic tanks and tile fields located at Shaw AFB. Tanks range in size from 1000 gallons to 2800 gallons. All four are located in outlying areas within the base boundary, east of the runway. No hazardous wastes are known or suspected to have been disposed of by these septic tanks.

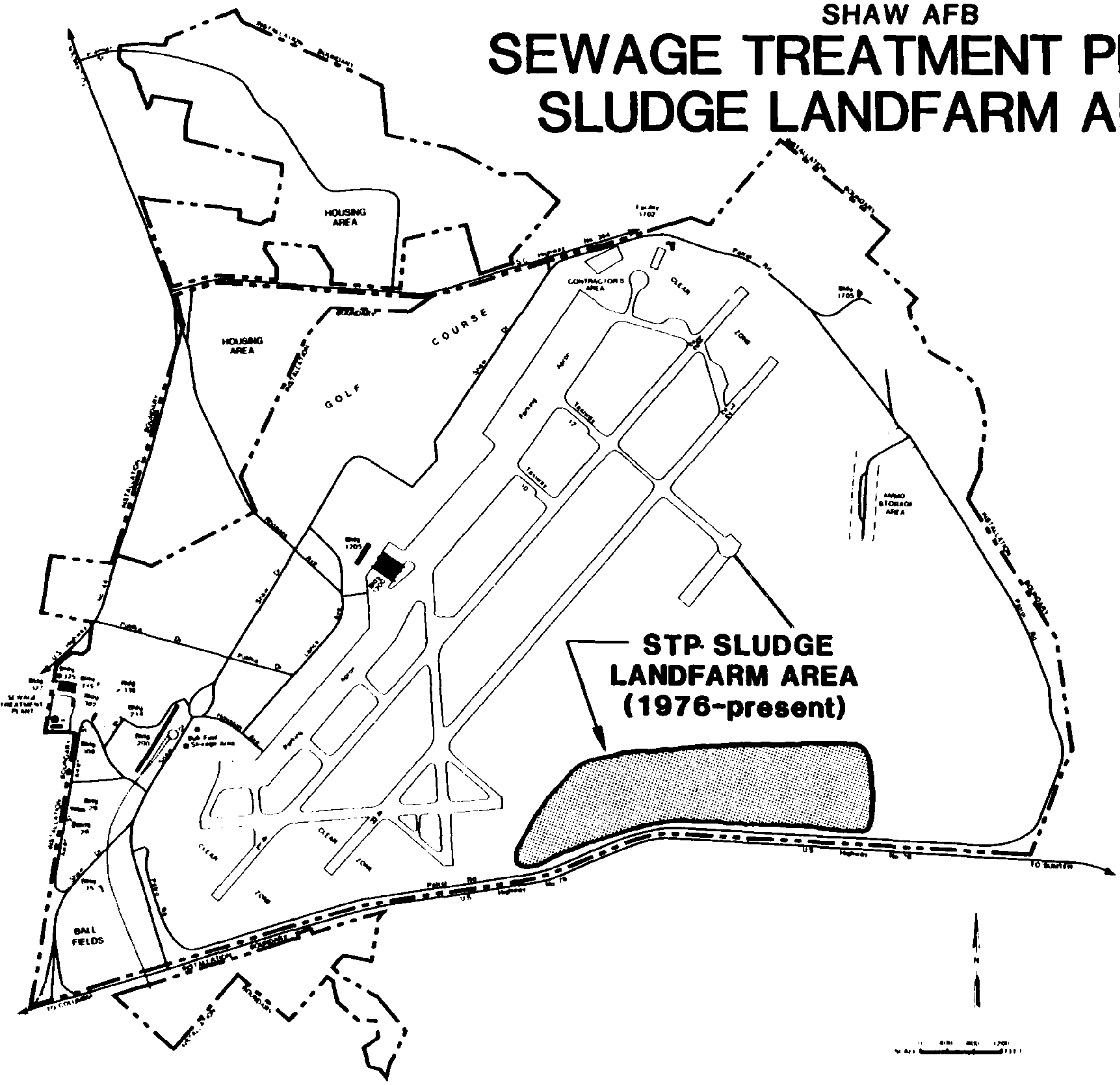
Sewage Treatment Plant and Sludge Landfarming

Shaw AFB treats domestic sanitary waste from base facilities and the housing area in an extended aeration treatment process followed by multi-media filtration. The plant was upgraded to the current system in 1974. The design capacity is 1.2 MGD; however, average flows are approximately 750,000 gallons per day. The effluent from the treatment plant is piped 4370 feet to Beech Creek which empties into Wateree Swamp. The effluent from the treatment plant has been sampled monthly at the discharge weir. The effluent data between 1977 and 1981 is presented in Appendix D, Table D.4. Based on the data all parameters, with the exception of phenol, are within the South Carolina NPDES permit criteria. Phenol concentrations in the treatment plant effluent were typically 10 ug/l and the standard for this parameter is 5 ug/l. The majority of the phenols originate from the industrial shop areas due to the rinsing of miscellaneous chemicals into the sanitary sewer.

Sludge from the sewage treatment plant is either dried in the sludge drying beds or diverted to a sludge holding tank until it can be hauled to the area on base designated as the sludge landfarm. Dried sludge was disposed of in past years within the on-base landfills. Since approximately 1976, the dried sludge and liquid sludge have been disposed of in the sludge landfarm located along the southern edge of the base (Figure 4.6). The EPA leachate extraction test was performed

FIGURE 4.6

SHAW AFB
SEWAGE TREATMENT PLANT SLUDGE LANDFARM AREA



SOURCE: SHAW AFB INSTALLATION DOCUMENTS

on representative sludge samples collected from the sewage treatment plant. The constituents analyzed were all found to be well below the RCRA EP Toxicity Standards. The test results are presented in Appendix D, Table D.3.

Storm Drainage System

The storm drainage system on Shaw AFB consists primarily of concrete conduits and open drainage channels (refer to Figure 3.2). A major portion of the surface runoff from the base, including the flight-line and industrial areas, drains to an underground pipe system which discharges into the North Ditch. This ditch exits the base to the north and flows to Long Branch Creek which drains to Booth's Pond located very near the northeast boundary of the base. The overflow from Booth's Pond drains to the Pocataligo River. In the past, runoff contaminated with oil was reported to have entered Booth's Pond via the North Ditch. This problem has been remedied by the installation in 1978 of an oil/water separator system on the North Ditch just upstream of the base boundary. No incidences of contamination to Booth's Pond have been reported since the installation of this system.

An additional portion of the surface drainage from the base flows through culverts under U.S. Highway 76 and is dissipated into creek branches. This drainage also eventually enters the Pocataligo River.

POINSETT RANGE

Poinsett Range is located in Manchester State Forest, Sumter County, South Carolina, approximately 7.5 miles south of Shaw AFB (refer to Figure 2.2). The range is comprised of three leased tracts totaling 8,038 acres. (State of South Carolina - 7,687 acres and a total of 351 acres from two other private landowner leases). The range has been in operation since 1951.

The purpose of the range is to provide a training facility to be used by military aviators in various bombing and gunnery methods. Poinsett Range is used by Shaw, Seymour Johnson, and Myrtle Beach Air Force Bases and several Air National Guard units.

The land on which this range is located is covered primarily with timber. The timber lands vary from low swampland areas, where mostly hardwood and white cedar are found, to upland areas supporting pine and

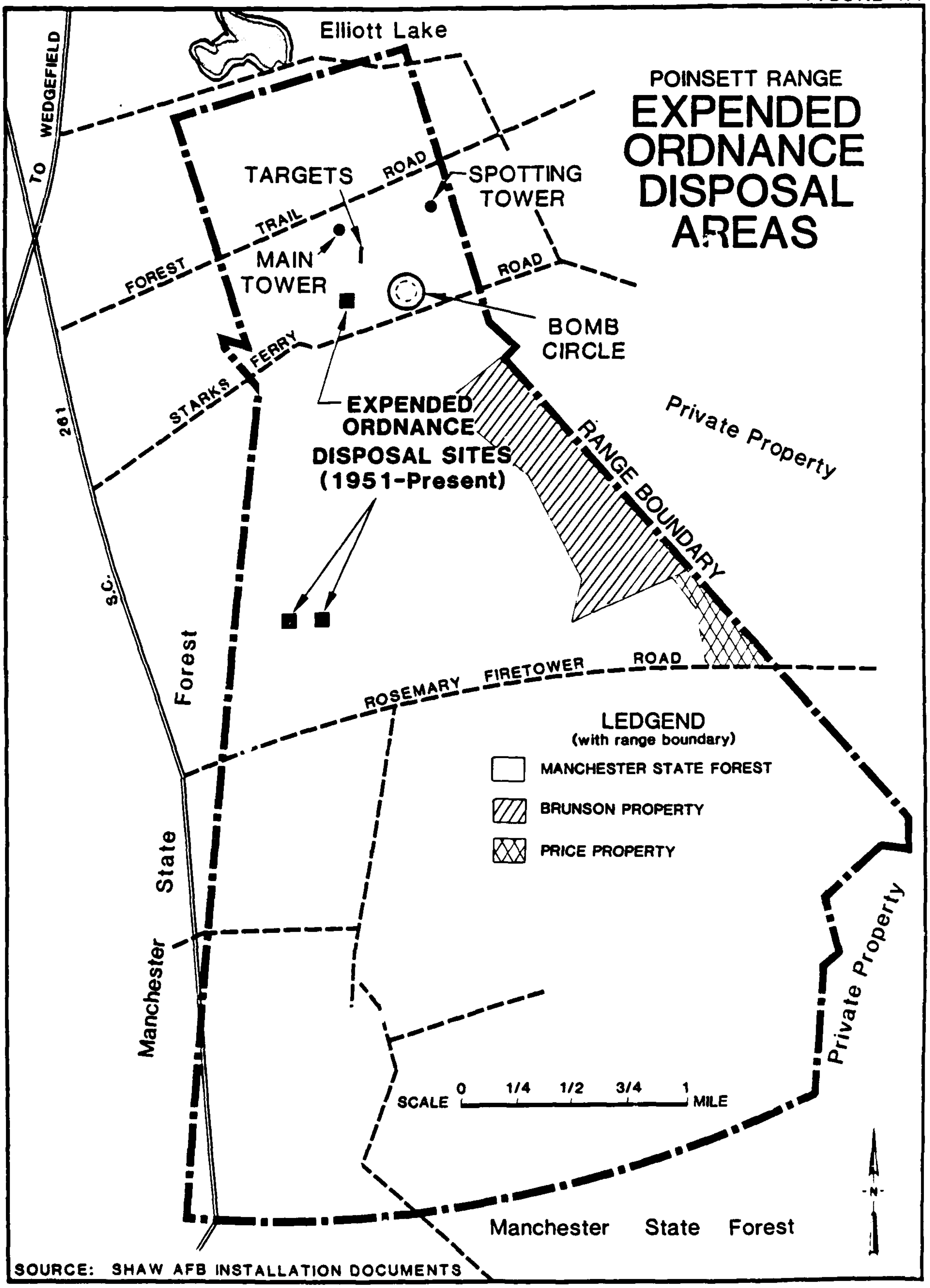
blackjack oaks. The impact area, where observation towers and other facilities including targets are located, has been cleared of all timber and underbrush. This area is near the north end of the range (Figure 4.7). There are some areas within the range where old abandoned fields exist that have been artificially planted with pine seedlings of slash, loblolly, and yellow pine. Where it has been possible, the State Forestry Commission has carried out timber management practices such as thinning, planting, and constructing fire and truck lanes.

Water quality in the vicinity is not affected by the range activities. One well on the site provides the necessary potable water. Sewage is disposed of on the site through septic tank treatment and an adequate drain tile field for seepage back into the ground. There are no pollutants being discharged into any streams in this area. The impact upon fish and wildlife in the area is minimal.

No general refuse is disposed of on the range. Expended ordnance has been buried in three locations on the range (Figure 4.7). Live ordnance is not used on the Poinsett Range; therefore, the munitions used are generally metal casings containing a spotting charge equivalent to a shotgun shell. The munition items collected on the range and brought to it from Shaw AFB, Myrtle Beach AFB, Seymour Johnson AFB and McEntire ANG Base are destroyed by fire or explosion within a demolition pit. All items are verified as explosive-free by Explosive Ordnance Disposal (EOD) personnel before burial. Items buried in these pits consist primarily of metal and concrete fragments. The trenches are typically 30 feet wide and twelve feet deep. No water has been observed in the pits. Soils in the area are sandy. The explosive ordnance area has warning signs, a warning flag, perimeter fence and a lockable gate. Since Poinsett Range was acquired by the Air Force, EOD has used the area for explosive training, destruction of training munitions and disposal of other miscellaneous small ordnance items.

EVALUATION OF PAST DISPOSAL ACTIVITIES AND FACILITIES

The review of past operation and maintenance functions and past waste management practices at Shaw AFB has resulted in the identification of sites which were initially considered as areas of concern with regard to the potential for contamination, as well as the potential for



SOURCE: SHAW AFB INSTALLATION DOCUMENTS

the migration of contaminants. These sites were evaluated using the Decision Tree Methodology referred to in Figure 1.1. Those sites which were considered as not having a potential for contamination were deleted from further consideration. Those sites which were considered as having a potential for the occurrence of contamination and migration of contaminants were further evaluated using the Hazard Assessment Rating Methodology (HARM). Table 4.3 identifies the decision tree logic used for each of the areas of initial concern.

Based on the decision tree logic 7 of the 20 sites originally reviewed were not considered to warrant evaluation using the Hazard Assessment Rating Methodology. The rationale for omitting these seven sites from HARM evaluation is discussed below.

The four hardfill sites identified on the base received only construction rubble (i.e., scrap wood, concrete, metal and bricks) and landscape debris. These materials are typically inert or non-putriscible and hence, would not cause any contamination to the soils or ground water.

The DPDO storage area is the site where many hazardous wastes are now temporarily stored until contractors remove the waste from the base. Since only very small leaks have occurred in this area, the site is not considered to be contaminated. The area is not equipped with proper spill containment systems and therefore is considered to have potential for environmental concern.

The PCB transformer storage areas were examined and no leaks or spills were observed or reported to have occurred. This area was not considered to be contaminated. The area is not equipped with proper containment systems and has a potential for other environmental concerns.

The Entomology Shop washrack holding tank is connected to the sanitary sewer system. Since no significant spills of pesticides have occurred in this area, the area is not considered to be contaminated. Due to the piping arrangement, a potential does exist for pesticides to discharge to the sewage treatment plant. This problem has a potential for other environmental concerns.

The remaining 13 sites identified on Table 4.3 were evaluated using the Hazard Assessment Rating Methodology. The HARM process takes into

TABLE 4.3
SUMMARY OF DECISION TREE LOGIC FOR AREAS OF INITIAL
ENVIRONMENTAL CONCERN AT SHAW AFB

Site Description	Potential For Contamination	Potential For Contaminant Migration	Potential For Other Environmental Concern	Refer to Base Environmental Programs	HARM Rating
Landfill No. 1	YES	YES	N/A	N/A	YES
Landfill No. 2	YES	YES	N/A	N/A	YES
Landfill No. 3	YES	YES	N/A	N/A	YES
Hardfill Areas (4 sites)	NO	NO	NO	N/A	NO
DPDO Storage Area	YES	NO	YES	YES	NO
Entomology Washrack	YES	NO	YES	YES	NO
Fire Protection Training Area No. 1	YES	YES	N/A	N/A	YES
Fire Protection Training Area No. 2	YES	YES	N/A	N/A	YES
Fire Protection Training Area No. 3	YES	YES	N/A	N/A	YES
Inactive Coal Storage Area	YES	YES	N/A	N/A	YES
Expended Ordnance Disposal Area (Poinsett Range)	YES	YES	N/A	N/A	YES
Sewage Treatment Plant Sludge Landfarm	YES	YES	N/A	N/A	YES
Fuel Tank Sludge Burial Site	YES	YES	N/A	N/A	YES
JP-4 Spill Site	YES	YES	N/A	N/A	YES
Battery Acid Leak Area	YES	YES	N/A	N/A	YES
PCB Transformer Storage Area	YES	NO	N/A	N/A	NO
CE Complex Storm Drainage Outfall	YES	YES	N/A	N/A	YES

N/A - Not Applicable

account characteristics of potential receptors, waste characteristics, pathways for migration, and specific characteristics of the site related to waste management practices. The details of the rating procedures are presented in Appendix G. Results of the assessment for the sites are summarized in Table 4.4. The HARM system is designed to indicate the relative need for follow-on action. The information presented in Table 4.4 is intended for assigning priorities for further evaluation of the Shaw AFB disposal areas (Chapter 5, Conclusions and Chapter 6, Recommendations). The rating forms for the individual waste disposal sites at Shaw AFB are presented in Appendix H. Photographs of some of the key disposal sites are included in Appendix F.

TABLE 4.4

SUMMARY OF HARM SCORES FOR POTENTIAL CONTAMINATION SOURCES

Rank	Site Name	Receptor Subscore	Waste Characteristics Subscore	Pathways Subscore	Waste Management Factor	Overall Total Score
1	Fire Protection Training Area No. 1	57	80	63	1.0	67
2	CE Complex Storm Drainage Outfall	61	40	78	1.0	60
3	Landfill No. 3	62	40	63	1.0	55
4	JP-4 Spill Site	65	48	48	1.0	54
5	Fuel Tank Sludge Burial Site	59	38	63	1.0	53
6	Fire Protection Training Area No. 3	51	60	47	0.95	50
7	Fire Protection Training Area No. 2	51	48	48	1.0	49
8	Landfill No. 2	57	20	68	1.0	48
9	Landfill No. 1	59	20	63	1.0	47
10	Battery Acid Leak Area	66	20	48	1.0	45
11	Inactive Coal Storage Area	57	30	48	0.95	43
12	Sewage Treatment Plant Sludge Landfarm	62	15	48	1.0	42
13	Expended Ordnance Disposal Area (Poinsett Range)	49	15	56	1.0	40

CHAPTER 5

CONCLUSIONS

CHAPTER 5

CONCLUSIONS

The goal of the IRP Phase I study is to identify sites where there is the potential for environmental contamination resulting from past waste disposal practices and to assess the probability of contaminant migration from these sites. The conclusions given below are based on the assessment of the information collected from the project team's field inspection, review of records and files, review of the environmental setting, and interviews with base personnel, past employees and state and local government employees. Table 5.1 contains a list of the potential contamination sources identified at Shaw AFB and a summary of HARM scores for those sites.

Fire Protection Training Area No. 1

Fire Protection Training Area No. 1 has a high potential for environmental contamination. Training exercises were conducted in this area from 1941 until 1969. From 1941 until the mid-1960's, various types of combustible waste chemicals were brought to this area in drums and burned during the training exercises. The waste materials included contaminated fuels, waste oils, solvents and other miscellaneous chemicals. The burn area did not have a liner system nor was there any pre-application of water to inhibit the percolation of waste chemicals into the soil. Additionally, it was reported that empty drums and fuel tank sludge had been buried within the area. Sludge which may have been generated from Avgas storage tanks could contain tetraethyl lead. The site is approximately 3.5 acres and underlain by permeable sandy soil. Ground water probably occurs at shallow depth (10 to 15 feet). Long Branch Creek is situated approximately 100 yards northeast of the site. The site received a HARM score of 67.

CE Complex Storm Drainage Outfall

The CE Complex Storm Drainage Outfall has a moderate potential for environmental contamination. Rinsing of pesticide spray equipment

TABLE 5.1

PRIORITY RANKING OF POTENTIAL CONTAMINATION SOURCES
SHAW AFB

Rank	Site Name	Date of Operation or Occurrence	Overall Total Score
1	Fire Protection Training Area No. 1	1941-1969	67
2	CE Complex Storm Drainage Outfall	1941-1980	60
3	Landfill No. 3	1945-1976	55
4	JP-4 Spill Site	Early 1970's	54
5	Fuel Tank Sludge Burial Site	1960's	53
6	Fire Protection Training Area No. 3	1981-present	50
7	Fire Protection Training Area No. 2	1970-1981	49
8	Landfill No. 2	1945	48
9	Landfill No. 1	1941-1945	47
10	Battery Acid Leak Site	Early 1970's	45
11	Inactive Coal Storage Area	1941-1969	43
12	Sewage Treatment Plant Sludge Landfarm	1976-present	42
13	Expended Ordnance Disposal Area	1951-present	40

NOTE: This ranking was performed according to the Hazard Assessment Rating Methodology (HARM) described in Appendix G. Individual site rating forms are in Appendix H.

and empty pesticide containers was performed at areas adjacent to the Entomology Shops, during the period of 1941 to 1980. Between 1941 and 1973 the shop was located in Building 308. The shop was then relocated to its present facility, Building 315. At both locations the rinsate was discharged to the storm drainage system. In 1980 this practice ceased. Both locations fed one common storm drain. The pesticides released to the storm drainage system have likely been diluted or dissapated; however, a potential exits for residues to be present in sediments in the drainage ditch. Soils in the area of the discharge are sandy and moderately permeable. Ground water is usually present at a shallow depth (10 to 15 feet). The outfall site received a HARM score of 60.

Landfill No. 3

Landfill No. 3 has a moderate potential for environmental contamination. The landfill was utilized to dispose of general refuse generated at the base as well as coal ash, miscellaneous waste or spent chemicals and other scrap between 1945 and 1976. Trench and fill procedures were used. Burning of the waste was conducted on the western portion of the landfill between 1945 through the early 1960's. The trenches were approximately 12 feet below grade. The landfill is located in an area whose geology is dominated by the sandy soils characteristics of the flatlands. Ground-water is usually present at a shallow depth (10 to 15 feet deep). The site has been closed and is partially covered with grass. Some ponding of water has occurred on the surface of the landfill. Landfill No. 3 received a HARM score of 55.

JP-4 Spill Site

The JP-4 spill site has a low potential for environmental contamination. The spill site is located at the JP-4 offloading railhead. Several spills have occurred in this area between the 1950's and the present. The most significant occurred in the early 1970's and involved several thousand gallons of fuel. The fuel spilled into the drainage system along Shaw Drive and either evaporated or seeped into the soil. No fuel left the base property. Soils in the area are sandy and moderately permeable and the ground water is usually present at depths less than twenty feet. Most of the JP-4 has probably been dispersed and biologically degraded by now since the spills occurred many years ago,

the soils are moderately permeability and the high water table is near the surface. The site received a HARM score of 54.

Fuel Tank Sludge Burial Site

The Fuel Tank Sludge Burial Site has a low potential for environmental contamination. The area is situated in the southwest corner of the POL bulk fuel storage facility. Sludge removed from the bottom of the fuel tanks was allowed to weather in a shallow pit and then covered over. Most of the fuel would have evaporated prior to burial. Sludge from Avgas tanks (used during the 1940's) may have contained tetraethyl lead residue. The soils in the area are sandy and moderately permeable. The site received a HARM score of 51.

Fire Protection Training Area No. 3

Fire Protection Training Area No. 3 has a low potential for environmental contamination. The training area was constructed and has been in use since 1981. It was constructed over well-compacted soil and is equipped with a drain in the training pit leading to an oil/water separator system discharging to a drain tile field. Only JP-4 has been burned in the training area. The pit is soaked with water prior to the application of fuel to inhibit the fuel from percolating into the soil. The site is underlain by sandy, permeable soils. Ground water occurs at shallow depths (12' to 17' deep). Fire Protection Training Area No. 3 received a HARM score of 50.

Fire Protection Training Area No. 2

Fire Protection Training Area No. 2 has a low potential for environmental contamination. The training area is situated in an open field east of the main runway. Only JP-4 had been burned during training exercises that took place between 1970 and 1981. The burn pit was soaked with water prior to the application of fuel to inhibit the fuel from percolating into the ground. The site is underlain by moderately permeable sandy soils. Ground water occurs at shallow depths (12' to 17' deep). Fire Protection Training Area No. 2 received a HARM score of 49.

Landfill No. 2

Landfill No. 2 has a low potential for environmental contamination. The landfill was used for a brief period during 1945. Its use was discontinued due to the high water table in the area (water entered the trenches). The trenches were reported to have been less than 20 feet

deep. General refuse was disposed of in this landfill which may have included small quantities of waste industrial chemicals and petroleum products. The wastes were burned prior to burial. The landfill is closed and covered with grass. The site is less than 0.5 acres and underlain by moderately permeable sandy soil. The site received a HARM score of 48.

Landfill No. 1

Landfill No. 1 has a low potential for environmental contamination. The landfill was used for disposing of general refuse between 1941 and 1945. The refuse was routinely burned prior to burial. Only small amounts of chemical or petroleum wastes are suspected to have been disposed of within the site. Trenches in the landfill were reported to have been approximately 20 to 30 feet deep. The ground water in the area is shallow; however, no ground water was reported to have entered the trenches. The landfill is less than two acres and is situated on sandy permeable soils. The landfill is now closed and used as a contractor storage area. The site received a HARM score of 47.

Battery Acid Leak Site

The Battery Acid Leak Site has a low potential for environmental contamination. The site is located adjacent to Building 327 in an area where vehicle batteries were once stored. An underground cement asbestos water pipe traversing the area failed, probably as a result of acid leaks. Batteries are no longer stored in the area and no evidence of the past leakage is apparent. The site received a HARM score of 45.

Inactive Coal Storage Area

The Inactive Coal Storage Area is considered to have a low potential for environmental contamination. Shaw AFB utilized coal as a fuel for its central heating plants between 1941 and 1969. The coal was stored on a crushed stone pad in the southwest portion of the base (located adjacent to the ballfields). The area has been cleaned and no evidence of coal residuals is apparent. No surface drainage ditches are located in the immediate vicinity of the storage area. The ground water in the area is shallow (12' to 17' deep). Soils in the area are sandy and permeable. The Inactive Coal Storage Area received a HARM score of 43.

Sewage Treatment Plant Sludge Landfarm

The Sewage Treatment Plant Sludge Landfarm is considered to have a low potential for environmental contamination. Wet and dry sludge generated at the sewage treatment plant have been disposed of since 1976 in a planted pine area located on the southern border of the base. The sludge has been tested and found to be non-hazardous (according to the RCRA EP Toxicity Test). The site is located on sandy, moderately permeable soils. Ground water in the area is shallow (10' to 15' deep). The Sewage Treatment Plant Sludge Landfarm received a HARM score of 42.

Expended Ordnance Disposal Area

The Expended Ordnance Disposal Area located on the Poinsett Range has a low potential for environmental contamination. The area is primarily used for the disposal of expended munition items. These items are burned prior to burial to render the item non-explosive; hence, the materials buried consist mainly of metal scraps and concrete. These materials are buried in trenches approximately 12 feet deep. Soils in the area are reported to be sandy and permeable. No wells are located in close proximity to the site. Ground water in the area is shallow (15' to 20'). The Ordnance Disposal Area received a HARM score of 40.

CHAPTER 6

RECOMMENDATIONS

CHAPTER 6
RECOMMENDATIONS

Thirteen sites were identified at Shaw AFB and Poinsett Range as having the potential for environmental contamination and have been evaluated using the HARM system. This evaluation assessed their relative potential for environmental contamination and identified those sites where further study and monitoring may be necessary. Of primary concern are those sites with a high potential for environmental contamination that should be investigated in Phase II. Sites of secondary concern are those with moderate potential for environmental contamination. Further investigation at these sites is also recommended. No further monitoring is recommended for those sites with low potential for environmental contamination, unless other data collected indicate a potential problem could exist at one of these sites. All sites have been reviewed with regard to future land use restrictions which may be applicable due to the nature of each site.

PHASE II MONITORING RECOMMENDATIONS

The following recommendations are made to further assess the potential for environmental contamination from waste disposal areas at Shaw AFB. The recommended actions are generally one-time sampling programs to determine if contamination does exist at the site. If contamination is identified, the sampling program may need to be expanded to further define the extent of contamination. The recommended monitoring program for Phase II is summarized in Table 6.1.

1) Fire Protection Training Area No. 1 has a high potential for environmental contamination and monitoring of this site is recommended. A ground-water monitoring system should be established to characterize the ground-water quality and identify any contaminant migration. One upgradient and three downgradient monitoring wells should be installed adjacent to the fire protection training area.

TABLE 6.1
RECOMMENDED MONITORING PROGRAM FOR PHASE II
SHAW AFB

Site	Rating Score	Recommend Monitoring	Comments
1) Fire Protection Training Area No. 2	67	Install one upgradient and three downgradient ground-water monitoring wells. Wells should be constructed of Schedule 40 PVC, screened into the top of the water table (about 25 feet deep). Sample these wells and Well No. 8 and analyze for parameters in Table 6.2, List A.	Continuue monitoring if sampling indicates contamination. Additional wells may be necessary to assess extent of contamination.
2) CE Complex Storm Drainage Outfall	60	Sediment and surface water samples collected near Bldg. 315 and at the combined storm drainage outfall. Analyze for the presence of pesticide compounds identified in Table 6.2, List C.	Establish additional sampling stations if contamination is found to determine the extent of contamination.
3) Landfill No. 3 No. 2	55	Install one upgradient and four downgradient ground-water monitoring wells. Wells should be constructed of Schedule 40 PVC, screened into the top of the water table (about 25 feet deep). Sample these wells and Well No. 6 and analyze for parameters in Table 6.2, List B.	Continuue monitoring if sampling indicates contamination. Additional wells may be necessary to assess extent of contamination.

The wells should be constructed of Schedule 40 PVC, screened into the top of the water table (about 25 feet deep). Existing well No. 8 should also be sampled. Samples collected from these wells should be analyzed for the parameters in Table 6.2, List A.

2) The CE Complex Storm Drainage Outfall has a moderate potential for environmental contamination and monitoring of this site is recommended. Sediment and surface water sampling should be carried out at three stations along the flowpath; namely, near Building 308, near Building 315 and at the combined storm drain outfall. Samples collected should be analyzed for the presence of the pesticide compounds listed in Table 6.2, List C.

3) Landfill No. 3 has a moderate potential for environmental contamination. A ground-water monitoring system should be established to characterize the ground-water quality and identify any contaminant migration. One upgradient and four downgradient monitoring wells should be installed in the area adjacent to the landfill. The wells should be constructed of Schedule 40 PVC, screened into the top of the water table (about 25 feet deep). Existing wels No. 6 should also be sampled. Samples collected from these wells should be analyzed for the parameters in Table 6.2, List B.

RECOMMENDED GUIDELINES FOR LANDUSE RESTRICTIONS

The recommended guidelines for future land use restrictions on each of the 13 sites are presented in Table 6.3. An item-by-item description of these guidelines is presented in Table 6.4.

TABLE 6.2
RECOMMENDED LIST OF ANALYTICAL PARAMETERS
SHAW AFB

List A

GC/MS scan
Total organic carbon
pH
Oil and grease
Total dissolved solids
Interim Primary Drinking Water Standards (selected list)

Arsenic	Lead	Endrin	2,4,5-TP
Barium	Mercury	Lindane	Radium
Cadmium	Nitrate	Methoxychlor	
Chromium	Selenium	Toxaphene	
Fluoride	Silver	2,4-D	

List B

GC/MS Scan
Total organic carbon
pH
Copper
Zinc
Manganese
Oil and grease
Nickel
Cyanide
Sulfate
Total dissolved solids
Interim Primary Drinking Water Standards (selected list)

Arsenic	Lead	Endrin	2,4,5-TP
Barium	Mercury	Lindane	Radium
Cadmium	Nitrate	Methoxychlor	
Chromium	Selenium	Toxaphene	
Fluoride	Silver	2,4-D	

List C

2,4,5-TP
Chlordane
DDT and its metabolates
Non-phosphate radical of carbaryl (sevin)

TABLE 6.3
RECOMMENDED GUIDELINES FOR FUTURE LAND USE RESTRICTIONS AT POTENTIAL CONTAMINATION SITES

Site Name	Recommended Guidelines for Future Land Use Restrictions											
	Construction on the site	Excavation	Well construction on or near the site	Agricultural use	Silvicultural use	Water Infiltration (Run-on, ponding, irrigation)	Recreational use	Burning or ignition source	Disposal operations	Vehicular traffic	Material storage	Housing on or near the site
Fire Protection Training No. 1	X	X	X	X		X	X		X		X	X
CE Complex Storm Drainage Outfall			X	X			X		X		X	X
Landfill No. 3	X	X	X	X	X	X	X	X	X		X	X
JP-4 Spill Site			X	X			X	X	X			X
Fuel Tank Sludge Burial Site	X	X	X	X			X		X		X	X
Fire Protection Training Area No. 3	X		X	X		X	X		X			X
Fire Protection Training Area No. 2	X		X	X			X		X			X
Landfill No. 2	X	X	X	X	X	X	X	X	X		X	X
Landfill No. 1	X	X	X	X	X	X	X	X	X		X	X
Battery Acid Leak Site			X									
Inactive Coal Storage Area			X	X								
Sewage Treatment Plant Sludge Landfarm			X				X					X
Expended Ordnance Disposal Area	X	X	X	X	X	X	X	X		X	X	X

TABLE 6.4
DESCRIPTION OF GUIDELINES FOR LAND-USE RESTRICTIONS

Guideline	Description
Construction on the site	Restrict the construction of structures which make permanent (or semi-permanent) and exclusive use of a portion of the site's surface.
Excavation	Restrict the disturbance of the cover or subsurface materials.
Well construction on or near the site	Restrict the placement of any wells (except for monitoring purposes) on or within a reasonably safe distance of the site. This distance will vary from site to site, based on prevailing soil conditions and ground-water flow.
Agricultural use	Restrict the use of the site for any and all agricultural purposes to prevent food chain contamination.
Silvicultural use	Restrict the use of the site for silvicultural uses (root structures could disturb cover or subsurface materials).
Water infiltration	Restrict water run-on, ponding and/or irrigation of the site. Water infiltration could produce contaminated leachate.
Recreational use	Restrict the use of the site for recreational purposes.
Burning or ignition sources	Restrict any and all unnecessary sources of ignition, due to the possible presence of flammable compounds.
Disposal operations	Restrict the use of the site for waste disposal operations, whether above or below ground.
Vehicular traffic	Restrict the passage of unnecessary vehicular traffic on the site due to the presence of explosive material(s) and/or of an unstable surface.
Material storage	Restrict the storage of any and all liquid or solid materials on the site.
Housing on or near the site	Restrict the use of housing structures on or within a reasonably safe distance of the site.

APPENDIX A

BIOGRAPHICAL DATA

J. R. Absalon, C.P.G.
R. J. Reimer
E. J. Schroeder, P.E.
M. I. Spiegel

Biographical Data

JOHN R. ABSALON
Hydrogeologist

PII Redacted

[redacted]

Education

B.S. in Geology, 1973, Upsala College, East Orange, New Jersey

Professional Affiliations

Certified Professional Geologist (Indiana No. 46)
Association of Engineering Geologists
Geological Society of America
National Water Well Association

Experience Record

1973-1974 Soil Testing Incorporated-Drilling Contractors, Seymour, Connecticut. Geologist. Responsible for the planning and supervision of subsurface investigations supporting geotechnical, ground-water contamination, and mineral exploitation studies in the New England area. Also managed the office staff, drillers, and the maintenance shop.

1974-1975 William F. Loftus and Associates, Englewood Cliffs, New Jersey. Engineering Geologist. Responsible for planning and management of geotechnical investigations in the northeastern U.S. and Illinois. Other duties included formal report preparation.

1975-1978 U.S. Army Environmental Hygiene Agency, Fort McPherson, Georgia. Geologist. Responsible for performance of solid waste disposal facility siting studies, non-complying waste disposal site assessments, and ground-water monitoring programs at military installations in the southeastern U.S., Texas, and Oklahoma. Also responsible for operation and management of the soil mechanics laboratory.

1978-1980 Law Engineering Testing Company, Atlanta, Georgia. Engineering Geologist/Hydrogeologist. Responsible for the project supervision of waste management, water quality assessment, geotechnical, and hydrogeologic studies at commercial, industrial, and government

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John R. Absalon (Continued)

facilities. General experience included planning and management of several ground-water monitoring programs, development of remedial action programs, and formulation of waste disposal facility liner system design recommendations. Performed detailed ground-water quality investigations at an Air Force installation in Georgia, a paper mill in southwestern Georgia, and industrial facilities in Tennessee.

1980-Date Engineering-Science. Hydrogeologist. Responsible for supervising efforts in waste management, solid waste disposal, ground-water contamination assessment, leachate generation, and geotechnical and hydrogeologic investigations for clients in the industrial and governmental sectors. Performed geologic investigations at twelve Air Force bases and other industrial sites to evaluate the potential for migration of hazardous materials from past waste disposal practices. Conducted RCRA ground-water monitoring studies for industrial clients and evaluated remedial action alternatives for a county landfill in Florida. Conducted quality management, hydrogeologic and ground-water quality programs for the pulp and paper industry at several mills located in the Southeast United States.

Publications and Presentations

"An Investigation of the Brunswick Formation at Roseland, NJ," 1973, with others, The Bulletin, Vol 18, No. 1, NJ Academy of Science, Trenton, NJ.

"Engineering Geology of Fort Bliss, Texas," 1978, coauthor: R. Barksdale, in Terrain Analysis of Fort Bliss, Texas, US Army Topographic Laboratory, Fort Belvoir, VA.

"Geologic Aspects of Waste Disposal Site Evaluations," 1980, with others, Program and Abstracts AEG-ASCE Symposium on Hazardous Waste Disposal, April 26, Raleigh, NC.

"Practical Aspects of Ground-Water Monitoring at Existing Disposal Sites," 1980, coauthor: R.C. Starr, Proceedings of the EPA National Conference on Management of Uncontrolled Hazardous Sites, HMCRI, Silver Spring, MD.

"Improving the Reliability of Ground-Water Monitoring Systems," 1981, Proceedings of the Madison Conference of Applied Research and Practice on Municipal and Industrial Waste, University of Wisconsin-Extension, Madison, WI.

John R. Absalon (Continued)

Ground-Water Monitoring Workshop, 1982. Presented to Mississippi Bureau of Pollution Control, Jackson, 15-17 February.

Ground-Water Monitoring Workshop, 1982. Presented to Alabama Division of Solid and Hazardous Waste, Huntsville, 20-21 July.

Ground-Water Monitoring Workshop, 1982. Presented to Kentucky Waste Management Division, Bowling Green, 27-28 July.

"Identification and Treatment Alternatives Evaluation for Contaminated Ground Water," 1982, coauthor: M. R. Hockenbury. Presented to Association of Engineering Geologists Symposium on Hazardous Waste Disposal, Atlanta, 17 September.

"Preliminary Assessment of Past Waste Storage and Disposal Sites," 1982, coauthor: W. G. Christopher. Presented to Association of Engineering Geologists Symposium on Hazardous Waste Disposal, Atlanta, 17 September.

#67

Biographical Data

ROBERT J. REIMER

PII Redacted

Chemical Engineer

[redacted]

Education

B.S. in Chemical Engineering, 1979, University of Notre Dame
B.A. in Art, 1979, University of Notre Dame
M.S. in Chemical Engineering, 1980, University of Notre Dame

Honors

Amoco Company Fellowship for Graduate Studies in Chemical Engineering, University of Notre Dame (1979-1980)

Professional Affiliations

American Institute of Chemical Engineers

Experience Record

1978-1979 PEDCo Environmental, Cincinnati. Engineer's Assistant. Responsible for compilation of data base report reviewing solid waste disposal in the nonferrous smelting industry. Participated in SO_2 scrubber emissions testing program, Columbus, Ohio. Worked on team establishing a computerized reference file on the overall smelting industry. Performed technical editing and report review.

1979-1980 Camargo Associates, Ltd., Cincinnati. Design Engineer and Draftsman. Responsible for HVAC design on numerous projects. Designed fire protection system for an industrial plastics press. Designer on various general plumbing jobs. Prepared EPA air pollution permit applications.

1980-Date Engineering-Science. Chemical Engineer. Responsible for the preparation of environmental reports and permit documents as well as providing general environmental assistance to clients to assure compliance with state and federal regulations.

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Robert J. Reimer (Continued)

1980-Date Developed cost estimates for several hazardous waste management facility closures. Prepared several Interim Status Standards Manuals, including Manifest Plans, Waste Analysis Plans, Closure Plans and Contingency/ Emergency Plans. Provided technical assistance in the design of a one-million gallon per year fuel alcohol production facility.

Provided assistance for a water reuse/reduction plan at a major petroleum refinery. Conducted an extensive review of emerging energy technologies for the Department of Energy. Participated in several Installation Restoration Programs for the U. S. Air Force. Ass ted in the design of a contaminated ground water air ip-ping column based on a lab model to be developed. re-pared several delisting petitions for the removal industrial wastestreams from EPA's hazardous waste st. Assisted in a study of waste oil reuse for the U. y CERL.

#10.8

Biographical Data

ERNEST J. SCHROEDER

Environmental Engineer
Manager, Solid and Hazardous Waste

PII Redacted

[redacted]

Education

B.S. in Civil Engineering, 1966, University of Arkansas, Fayetteville, Arkansas
M.S. in Sanitary Engineering, 1967, University of Arkansas, Fayetteville, Arkansas

Professional Affiliations

Registered Professional Engineer (Arkansas No. 3259, Georgia No. 10618, Texas No. 33556 and Florida No. 0029175)
Water Pollution Control Federation
American Academy of Environmental Engineers

Honorary Affiliations

Chi Epsilon

Experience Record

1967-1976 Union Carbide Technical Center, Engineering Department, South Charleston, West Virginia (1967-1968). Project Engineer. Responsible for environmental protection engineering projects for various organic chemicals and plastics plants. Conducted industrial waste surveys, landfill design, and planning for plant environmental protection programs; evaluated air pollution discharges from new sources; reviewed a wastewater treatment plant design; and participated on a project team to design a new chemical unit.

Union Carbide Corporation, Environmental Protection Department, Texas City, Texas (1969-1975). Project Engineer and Engineering Supervisor. Responsible for various aspects of plant pollution abatement programs, including preparation of state and federal permits for wastewater treatment activities.

5/83

#10.8
ERNEST J. SCHROEDER (Continued)

Operations Representative on $8 million regional wastewater treatment project and member of design team which made the initial site selection and process evaluation and recommendation. Participated in contract negotiations, process and detailed engineering design, construction of the facilities, preparation of start-up manuals, operator training, and the start-up activities. Designated as Project Engineer after start-up on expansion to original waste treatment unit.

Engineering Supervisor responsible for operation of wastewater treatment facilities including collection system, sampling and monitoring programs, spill control and clean-up, primary waste treatment, wastewater transfer system, biological waste treatment, and waste treatment pilot plants. Developed odor control program which successfully reduced odor emissions and represented Union Carbide at a public hearing on community odor problems.

Led special projects such as an excess loss control program to reduce water pollution losses; sewer segregation program involving coordination and reporting of 38 projects for the separation of contaminated and non-contaminated water; and sludge disposal program to develop long-term sludge disposal alternatives and recover land in present sludge landfill area. Developed improved methods of sampling and continuous monitoring of wastewater.

Union Carbide Corporation, Environmental Protection Project Engineer, Toronto, Ontario, Canada (1975-1976). Responsible for the overall environmental permitting, engineering design, construction and start-up of waste treatment systems associated with a new refinery.

1976-Date Engineering-Science, Inc., Project Manager (1976-1978). Responsible for several industrial wastewater projects including the following: wastewater investigation to characterize sources of waste streams in a chemical plant and to develop methods to reduce the wastes, sludge settling studies to evaluate settling characteristics of activated sludge at a chemical plant, development of a process document for the design and operation of a wastewater treatment facility at a petrochemical complex, wastewater treatment evaluation which included characterization of wastewater, unit process evaluation, inhibition studies, design review, operations review, preparation of operations manual, operator training and providing operating assistance for waste treatment facilities, various biological treatability studies and bench-scale and pilot-scale evaluation of advanced waste treatment technologies such as granular carbon adsorption, multimedia filtration, powdered activated carbon treatment, ion exchange and ozonation.

#10.8
ERNEST J. SCHROEDER (Continued)

Project Manager for hazardous waste disposal projects involving waste characterization, development of criteria for disposal of hazardous waste, site investigation, preparation of permits, detailed design, construction of facilities and spill clean-up activities.

Deputy Project Manager for industry-wide pilot plant study of advanced waste treatment in the textile industry. Technologies evaluated included coagulation/clarification, multi-media filtration, granular carbon adsorption, powdered activated carbon treatment, ozonation and dissolved air flotation.

Engineering-Science, Inc., Manager of the Industrial Waste Group in the Atlanta, Georgia office (1978-1980). Responsible for the supervision of industrial waste project managers and project engineers and the management of industrial waste studies conducted in the office. Also directly involved in project management consulting with clients on environmental studies and environment assessment projects, e.g., project manager for several spill control and wastewater treatability projects and for a third-party EIS for a new phosphate mine in Florida.

Engineering-Science, Inc., Manager of Solid and Hazardous Waste Group in the Atlanta, Georgia office (1980-date). Responsible for the supervision of solid and hazardous waste project managers and project engineers and the management of solid and hazardous waste projects in the office. Project activities have included permit and regulatory assistance, environmental audits, waste management program development, delisting partitions, ground-water monitoring, landfill evaluations, landfill closure design, hazardous waste management, waste inventory, waste recovery/recycle evaluation, waste disposal alternative evaluation, transportation evaluation, and spill control and countermeasure planning.

Project Manager for eight Phase I Installation Restoration Program projects for the U.S. Air Force. The objective of this program is to audit past hazardous waste disposal practices that could result in migration of contaminants and recommend priority sites requiring further investigation. Also conducted environmental audits (air, water and solid waste) at several industrial facilities. Project manager for a contamination assessment and site cleanup being conducted for an industrial client as part of a consent degree agreement.

#10.8
ERNEST J. SCHROEDER (Continued)

Publications and Presentations

Schroeder, E. J., "Filamentous Activated Sludge Treatment of Nitrogen Deficient Waste," research paper submitted in partial fulfillment of the requirements for MSCE degree, 1967.

Schroeder, E. J. and Loven, A. W., "Activated Carbon Adsorption for Textile Wastewater Pollution Control," Symposium Proceedings: Textile Industry Technology, December 1978, Williamsburg, VA.

Schroeder, E. J., "Summary Report of the BATEA Guidelines (1974) Study for the Textile Industry," North Carolina Section of AWWA/ WPCA, Pinehurst, North Carolina, November 1979.

Mayfield, R. E., Sargent, T. N. and Schroeder, E. J., "Evaluation of BATEA Guidelines (1974) Textiles," U.S. EPA Report, Grant No. R-804329, February 1980.

Storey, W. A. and Schroeder, E. J., "Pilot Plant Evaluation of the 1974 BATEA Guidelines for the Textile Industry," Proceedings of the 35th Industrial Waste Conference, Purdue University, May 1980.

Pope, R. L., and Schroeder, E. J., 'Treatment of Textile Wastewaters Using Activated Sludge With Powdered Activated Carbon," U.S. EPA Report, Grant No. R-804329, December 1980.

Schroeder, E. J., "Industrial Solid Waste Management Program to Comply with RCRA," Engineering Short Course Instructor, Auburn University, October 1980.

Schroeder, E. J., "Technical and Economic Impact of RCRA on Industrial Solid Waste Management, Florida Section, American Chemical Society, May 1981.

Schroeder, E. J. and Sargent, T. N., "Hazardous Waste Site Rating Systems," Textile Wastewater Treatment and Air Pollution Control Conference, January 1983.

Biographical Data

MARK I. SPIEGEL

Environmental Scientist

PII Redacted

[redacted]

Education

B.S. in Environmental Health Science (Magna cum laude), 1976, University of Georgia, Athens, Georgia

Limnology and Environmental Biology, University of Florida, Gainesville, Florida

MBA Candidate, Marketing, Georgia State University

Professional Affiliations

American Water Resources Association

Technical Association of the Pulp and Paper Industry

Experience Record

1974-1976 — U.S. Environmental Protection Agency, Surveillance and Analysis Division. Cooperative Student. On assignment to Air Surveillance Branch, participated in ambient air study in Natchez, Mississippi, and operated unleaded fuel sampling program for Southeast National Air Surveillance Network. For Engineering Branch, participated in NPDES compliance monitoring of industrial facilities throughout the southeast; operation and maintenance studies of municipal waste treatment facilities; and post-impoundment study of West Point Reservoir, West Point, Georgia. Participated in industrial bioassay studies for the Ecological Branch.

1977-Date — Engineering-Science. Environmental Scientist. Responsible for the conduct of water and wastewater sampling programs and analyses, quality control, laboratory process evaluations, and evaluation of other environmental assessment data. Conducted leachate extraction studies of sludges produced at a large organic chemicals plant to define nature of sludges according to the Resource Recovery and Conservation Act guidelines. Involved in laboratory quality assurance program for the analysis of water samples used in a stream modeling project. Conducted a water quality modeling study for Amerada Hess Corporation to determine the assimilative capacity of a stream receiving effluent from a southern Mississippi refinery.

Mark I. Spiegel (Continued)

Participated in bench-scale industrial treatability studies conducted for the American Textile Manufacturers Institute and Eli Lilly Pharmaceuticals in Mayaguez, Puerto Rico, and in carbon adsorption studies for an American Cyanamid chemical plant and Union Carbide Agricultural Products Division.

Involved in various aspects of several industrial environmental impact assessments including preliminary planning for a comprehensive study for St. Regis Paper Company on a major pulp and paper mill expansion project. Assisted in preparation of third-party EIS for EPA and Mobil Chemical Company concerning a proposed 16,000-acre phosphate mining and beneficiation facility. Developed an EIA prior to construction of a pulp and paper complex by the Weyerhaeuser Company in Columbus, Mississippi, which included preparation of a separate document for the Interstate Commerce Commission concerning the construction of a railroad spur to serve the complex. Also involved in formulating the water quality, water resource and socio-economic aspects of an environmental impact assessment for International Paper Company. Participated in large scale site evaluation to determine the suitability and environmental permitting requirements of a site for an east coast brewery for the Adolph Coors Company. Participated in a study to evaluate various options for developing a large parcel of land in the coastal section of North Carolina. The study involved evaluating both the market potential and environmental constraints of various options for development such as timber harvesting, peat mining, corporate farming and aquaculture (catfish farming).

Project Manager. Conducted comprehensive process evaluation of an 80 mgd wastewater treatment system for Weyerhaeuser Company. Responsible for a study to determine the leaching characteristics of sludges for a paint manufacturing facility for RCRA compliance. Also managed study for development of a solid waste management plan for a ceramic pottery manufacturer in northern Alabama which included evaluating surface and ground-water contamination potential from the existing disposal site and assisting manufacturer in developing a disposal program acceptable to state agencies.

Participated as project team member for Phase I Installation Restoration Program projects for the Department of Defense. Studies were conducted at

Mark I. Spiegel (Continued)

five Air Force bases to identify past hazardous waste disposal practices that could result in migration of contaminants and recommend priority sites requiring further investigation.

APPENDIX B

LIST OF INTERVIEWEES AND OUTSIDE AGENCY CONTACTS

APPENDIX B

TABLE B.1

LIST OF INTERVIEWEES

I. Past and Present Base Employees Interviewed

	Position	Period of Service
1.	Environmental Planner/Coordinator, 363 CES	1981-present
2.	Civil Engineering Shop Supervisor, 363 CES	1942-1975
3.	Civil Engineering Water and Waste Supervisor, 363 CES	1954-present
4.	Entomology Shop Supervisor, 363 CES	1960-present
5.	Landfill Manager, 363 CES	1953-present
6.	Engineering Technician, 363 CES	1960-present
7.	Community Planner, 363 CES	1977-present
8.	Heavy Equipment Operator, 363 CES	1944-1982
9.	Heavy Equipment Operator, 363 CES	1942-1972
10.	Fire Chief, 363 CES	1955-1975
11.	Fire Chief, 363 CES	1975-present
12.	Fire Department Personnel, 363 CES	1962-present
13.	Fire Department Personnel, 363 CES	1962-present
14.	Base Supply Personnel, 363 SS	1942-present
15.	Mechanical Supervisor, 363 CES	1960-present
16.	Foreman Liquid Fuels Maintenance, 363 CES	1960-present
17.	Service Station Supervisor, 363 SS	1979-present
18.	Exterior Electric Shop Supervisor, 363 CES	1968-present
19.	POL Officer-in-Charge, 363 SS	1982-present
20.	POL NCO, 363 SS	1982-present
21.	POL NCO, 363 SS	1981-present
22.	Defense Property Disposal Office Supervisor, DPDO	1964-present

TABLE B.1 (Continued)

	Position	Period of Service
23.	Defense Property Disposal Office Personnel, DPDO	1974-present
24.	Real Properties Officer, 363 CES	1980-present
25.	Heavy Equipment Operator, 363 CES	1956-1977
26.	Electrical Engineer, 363 CES	1971-present
27.	Engineering Technician Supervisor, U.S. Army COE	1941-1971
28.	Explosive Ordnance Disposal Branch Chief, EOD	1980-1983
29.	Base Historian, 363 TFW	1982-present
30.	POL Supervisor, 363 SS	1942-1973
31.	Sewage Treatment Plant Operator, 363 CES	1962-present
32.	Pavements and Grounds Supervisor, 363 CES	1979-present
33.	Sanitation Superintendent (temp. Environmental Coordinator), 363 CES	1975-1983
34.	Base Public Affairs Officer, 363 TFW	1981-present
35.	Plumbing Shop Supervisor, 363 CES	1974-present
36.	Heavy Equipment Operator, 363 CES	1945-1977
37.	Base Civil Engineer, 363 CES	1982-present
38.	Base Commander, 363 CSG	1982-present
39.	Chief Environmental and Contract Planning, 363 CES	1973-present
40.	Base Bioenvironmental Engineer, USAF Hosp.	1982-present
41.	BES NCO, USAF Hosp.	1981-present
42.	BES NCO, USAF Hosp.	1982-present
43.	AGE Shop Supervisor, 363 EMS	1978-present
44.	Corrosion Control Shop Supervisor, 363 EMS	1980-present
45.	Structural Repair Shop Supervisor, 4507 CAMS	1981-present

TABLE B.1 (Continued)

	Position	Period of Service
46.	Corrosion Control Shop Supervisor, 4507 CAMS	1981-present
47.	Structural Repair NCOIC, 363 CRS	1981-present
48.	Wheel and Tire Shop Supervisor, 363 EMS	1980-present
49.	Wheel and Tire Shop NCO, 363 EMS	1978-present
50.	Engine Shop NCOIC, 363 CRS	1967-1970, 1980-present
51.	Pneudraulics Shop NCO, 363 CRS	1980-present
52.	Egress Shop NCO, 363 EMS	1981-present
53.	Electric Shop NCO, 363 CRS	1979-present
54.	PMEL Laboratory NCOIC, 363 CRS	1980-present
55.	Aero Club Supervisor, 363 CSG	1972-present
56.	Power Production Shop Supervisor, 363 CES	1970-present
57.	AGE Shop NCOIC, 507 TACC	1977-present
58.	Corrosion Control Shop NCOIC, 507 TACC	1980-present
59.	Vehicle Maintenance Shop NCOIC, 507 TACC	1980-present
60.	Vehicle Maintenance Shop Civilian, 363 TRANS	1977-present
61.	Mobile Photo Lab Supervisor, 363 TFW	1981-present
62.	Helicopter Repair NCOIC, 4507 CAMS	1980-present
63.	Maintenance Supervisor, 682 ASOCS	1981-present
64.	Histopathology Lab NCO, USAF Hosp.	1980-present
65.	Munitions Shop NCO, 363 EMS	1980-present
66.	F-16 Photo Shop NCO, 363 CRS	1982-present
67.	NDI Laboratory NCO, 363 CRS	1982-present
68.	17th AMU Weapons Shop NCOIC, 363 TRANS	1981-present
69.	Refueling Maintenance NCOIC, 363 TRANS	1980-present

TABLE B.2

OUTSIDE CONTACTS

II. Interviews With Outside Agencies and Organizations

1. Caretaker of Booth's Pond (adjacent to base boundary), early 1970'S-present

2. Debbie Browning, Environmental Engineering Associate, South Carolina Department of Health and Environmental Control, Columbia, South Carolina.

3. Gary S. Hoover, South Carolina Department of Health and Environmental Control, Columbia, South Carolina.

4. Mark Blackman, Regional Officer, South Carolina Department of Health and Environmental Control, Columbia, South Carolina.

5. Gary K. Speiran, Hydrologist, Water Resources Division, U.S. Geological Survey, Columbia, South Carolina.

6. Art Limton, Federal Activities Coordinator, U.S. Environmental Protection Agency, Region IV, Atlanta, Georgia.

APPENDIX C
ORGANIZATIONS AND MISSIONS

APPENDIX C

ORGANIZATIONS AND MISSIONS

PRIMARY ORGANIZATION AND MISSION

The primary mission of the 363 Tactical Fighter Wing (TFW)is to employ tactical reconnaissance and fighter forces capable of meeting all operational requirements worldwide, to maintain a state of combat readiness and to operate Shaw AFB by providing facilities, personnel and and material.

The 363 TFW has three primary squadrons:

<u>16th Tactical Reconnaissance Squadron</u>

The 16th TRS is Shaw's only dual-based operational squadron. During peacetime the squadron is permanently assigned to and conducts all of its training at Shaw, but in times of increased tension the squadron is capable of deploying in minimum time.

<u>19th Tactical Fighter Squadron</u>

The 19th TFS was activated on 1 July 1982 as an F-16 Fighter Squadron. The primary mission will be to maintain a state of readiness with the capability for world wide deployment.

<u>17th Tactical Fighter Squadron</u>

The 17th TFS was activated on 1 October 1982 as the second F-16 fighter squadron for Shaw AFB. Its mission is similar to the 19th TFS.

TENANT ORGANIZATIONS AND MISSIONS

Shaw AFB is the host to several tenant organizations and provides services, facilities and other support to these organizations. The following list identifies the major tenant organizations located at Shaw AFB and briefly describes their missions.

<u>507th Tactical Air Control Wing</u>

The 507th TAIRCW is one of only three active duty Tactical Air Control Systems (TACS) in the world. The mission of the 507th TAIRCW includes support operations for the theater commander down to the

battlefield commander. The wing is responsible for commanding, organizing, equipping, training and administering assigned elements of the TACS for any exercise or real world emergency that may arise. Presently, the Wing includes 9 radar units, 33 0-2A, and 4CH-3 aircraft that support a consolidated maintenance squadron.

21st Tactical Air Support Squadron

The 21st Tactical Air Support Squadron (TASS) operates an airborne Forward Air Controller (FAC) program which employs 0-2A and OV-10 aircraft. These FACs perform air strike control, visual reconnaissance, search and rescue, artillery adjustment, and close air support. The 21st TASS also provides tatical air control parties capable of air strike control and liaison in direct support of Army units. Ground operations are conducted utilizing MRC 107/108 Mobile Radio Communications Centers. Both airborne and ground missions are an integrated part of the Tactical Air Control System.

4507th Consolidated Aircraft Maintenance Squadron

The 4507th Consolidated Aircraft Maintenance Squadron (CAMS) supports the 21st TASS mission by maintaining the 0-2A, OV-10, and CH-3 aircraft at Shaw AFB and five operating locations. This enables the 21st TASS to deploy world-wide in support of the Tactical Air Control System. When deployed, the 4507th CAMS is under the operational control of the 21st TASS.

703rd Tactical Air Support Squadron

The 703rd TASS provides CH-3E helicopter airlift, logistical support, and intratheater mobility for elements of the TACS.

9th Tactical Intelligence Squadron

The 9 TIS mission is to provide a deployable combat intelligence capability in direct support of a deployed Tactical Air Control System (TACS) and tactical units. The squadron supports appropriate tasking by storing and updating a worldwide digital data base; providing weaponeering recommendations for force planning and providing enhanced defense analysis data to support contingencies, exercises, and in-garrison training programs.

682nd Direct Air Support Center

The 682nd Direct Air Support Center Squadron (DASC) provides rapid processing of Army requests for immediate tactical support and is deployed in the field with U.S. Army components. The facilities consist of inflatable operations and communications modules as well as a variety or radio and telephone communications equipment to maintain contact with all levels of command. Through these communications systems, the DASC receives immediate requests for close air support, reconnaissance, and airlift from forward air controllers in the battle area. When deployed, the DASC is under the control of the Tactical Air Control Center.

507th Tactical Air Control Center

The Air Force uses the Tactical Air Control Center (TACC) to gather and activate superior tactics, the key to the effective use of tactical air power. It is able to react immediately to a threat or opportunity for the Air Force commander.

Field Training Detachment 307

FTD 307 provides associated training for the 363rd TRW, 507th TAIRCW, 4507th CAMS, and the 2020th Comm Sq. Instruction is carried out by combining classroom theory with actual flightline experience under close supervision.

Detachment 2, 1402d Military Airlift Squadron (MAC)

The mission of this detachment is to provide Air Force-directed airlift of priority personnel and cargo and to provide continuation training for staff-attached pilots.

3537th USAF Recruiting Squadron

The recruitng squadron is responsible for procuring personnel for the Air Force from North Carolina, South Carolina, and Eastern Georgia.

Ninth Air Force (TAC)

Ninth Air Force Headquarters, one of two numbered Air Forces in TAC, performs a wide range of missions from bases stretching from Minnesota to Southern Florida.

2020th Communications Squadron (AFCS)

The mission of the 2020th Communications Squadron is to provide communications electronic support and Air Traffic Control services to all units assigned to Shaw. The Comm Operations Branch operates the

Telecommunications Center, base telephone system, and the high frequency radio site. The Air Traffic Control Branch provides air traffic control services and NAVAID facilities to Shaw and the surrounding area. Radar Approach Control provides service to civilian and military aircraft operating in the Shaw Control Area while the Control Tower directs traffic in the visual flight rules (VFR) pattern.

Base Weather/Detachment 1, 3rd Weather Squadron (MAC)

Weather operates on a 24-hour forecasting schedule. The unit also has an on-site observer during Poinsett Range operations. The unit monitors the local weather both visually and through meteorlogical sensors.

Detachment 1372, Air Force Audit Agency

The Air Force Audit Agency Office provides all levels of Air Force management with independent, objective, and constructive evaluation of the effectiveness and efficiency with which managerial responsibilities are carried out. The audit activities at Shaw are performed by resident staff personnel.

Detachment 2102, District 21, Office of Special Investigations

The Office of Special Investigations (OSI) is the principal investigative agency of the USAF and is responsible for counterintelligence and major criminal and fraud investigations. The OSI also investigates alleged major offenses committed against persons or property of the U.S. Government.

USAF Hospital

The USAF Hospital at Shaw is a treatment facility that serves as a specialty and referral center for Shaw AFB and four other Air Force bases: Myrtle Beach AFB, S.C.; Charleston AFB, S.C.; Seymour Johnson AFB, N.C.; and Pope AFB, N.C. The hospital is a modern two story facility with an in-patient capacity of 90 beds. The following services are provided by the hospital staff: general medicine, internal medicine, pediatrics, general surgery, orthopedic surgery, ENT, obstetrics, gynecology, flight medicine, and psychiatry.

ADDITIONAL UNITS

Detachment 16, 4400 Management Engineering Squadron (TAC)

Detachment 1, 1701 Mobility Support Squadron (MAC)

Detachment 3, AF Commissary Service

Detachment 9, Tactical Communications Area (AFCS)

Detachment EGOO, 6948 Security Mobility (USAFSS)

Defense Property Disposal Office

District 23, Defense Investigative Service

Detachment QD 20 (USAF) Area Defense Counsel

USAF Postal Service Center

USAF Trial Judiciary/Area Defense Council

APPENDIX D

SHAW AFB SUPPLEMENTAL INFORMATION AND DATA

D.1 - Pesticides used at Shaw AFB
D.2 - POL Tank Information
D.3 - Shaw AFB Sewage Treatment Plant Sludge RCRA EP Toxicity Test Results
D.4 - Shaw AFB Sewage Treatment Plant Effluent Summary (1977-1981)
D.5 - D.10 - Shaw AFB Water Quality Monitoring Data Summary (1977-1981)

TABLE D.1

PESTICIDES USED AT SHAW AFB

Diazinone	(48%)	MSMA	(48%)
Warfarin	(.025%)	DSMA	(63%)
Diphicinone	(.005%%)	Tersan SP	(65%)
Zinc Phosphide	(74%)	Tersan LSR	(80%)
Baygon	(2%)	Tersan 1991	(50%)
Avirrol	(.5%)	Cambium Chloride	
Avirrol	(1%)	Kerb	(5%)
Sevin	(80%)	2,4-D	(46%)
Sevin	(5%)	Pramital	(25%)
Chlordane	(72%)	Tordon 101	
Malathion	(95%)	Tordon 10K	
Malathion	(57%)	Krovar I	
Dacinit	(63%)	Dachtal	(75%)
Hexachloride	(11%)	Round-up	
Vapona	(5%)		
Dursban	(41.2%)		

Source: Entomology Shop Inventory, January 1983

TABLE D.2

POL TANK INFORMATION

TANK	PRODUCT	APPROXIMATE CAPACITY (GAL)	LOCATION
1	JP-4	25,000	Bulk Storage
2	JP-4	25,000	Bulk Storage
3	JP-4	25,000	Bulk Storage
4	JP-4	25,000	Bulk Storage
5	JP-4	25,000	Bulk Storage
6	JP-4	25,000	Bulk Storage
7	JP-4	25,000	Bulk Storage
8	JP-4	25,000	Bulk Storage
9	JP-4	25,000	Bulk Storage
10	JP-4	25,000	Bulk Storage
11	Avgas	10,000	Bulk Storage
12	Avgas	25,000	Bulk Storage
13	Avgas	25,000	Bulk Storage
14	Avgas	25,000	Bulk Storage
15	Avgas	25,000	Bulk Storage
16	Fuel Oil #2	25,000	Bulk Storage
17	Fuel Oil #2	25,000	Bulk Storage
18	Fuel Oil #2	25,000	Bulk Storage
19	Fuel Oil #2	25,000	Bulk Storage
20	Fuel Oil #2	25,000	Bulk Storage
21	Mogas (Regular)	25,000	Railhead
22	Diesel	25,000	Railhead
23	Diesel	12,000	Railhead
24	Diesel	12,000	Railhead
25	Mogas (Regular)	12,000	Railhead
27	JP-4	525,000	Bulk Storage
28	JP-4	700,000	Bulk Storage
29	JP-4	50,000	Bulk Storage
30	JP-4	50,000	Bulk Storage
31	JP-4	50,000	Hydrant Station #1
32	JP-4	50,000	Hydrant Station #1
33	JP-4	50,000	Hydrant Station #1
34	JP-4	50,000	Hydrant Station #2
35	JP-4	50,000	Hydrant Station #2
36	JP-4	50,000	Hydrant Station #3
37	JP-4	50,000	Hydrant Station #4
38	JP-4	50,000	Hydrant Station #4
39	JP-4	50,000	Hydrant Station #4
40	JP-4	25,000	Hydrant Station #1 Defuel Tank
41	JP-4	20,000	Hydrant Station #2 Defuel Tank
42	JP-4	19,000	Hydrant Station #3 Defuel Tank
43	JP-4	25,000	Hydrant Station #4 Defuel Tank
44	JP-4	6,000	Unloading Tank, Railhead
45	Mogas (Unleaded)	10,000	Service Station
46	Mogas (Regular)	10,000	Service Station
47	Diesel	10,000	Service Station

Source: Shaw AFB Base Records, 1983

TABLE D.3

SEWAGE TREATMENT PLANT SLUDGE

RCRA EP TOXICITY TEST DATA

July 18, 1982

Parameter	Sample Concentration (mg/l)	Standards (mg/l)
Arsenic	<0.2	5.0
Barium	<10	100.0
Cadmium	<0.1	1.0
Chromium	<0.5	5.0
Lead	<0.02	5.0
Mercury	<0.02	0.2
Selenium	<0.1	1.0
Silver	<0.5	5.0
Endrin	<0.002	0.02
Lindane	<0.04	0.4
Methoxychlor	<1.0	10.0
Toxaphene	<0.05	0.5
2,4-D	<1.0	10.0
2,4,5-TP Silvex	<0.010	1.0

Ignitability was greater than 60°C.

Source: USAF OEHL

TABLE D.4

SHAW AFB WASTEWATER TREATMENT PLANT EFFLUENT SUMMARY (1977-1981)

SITE LOCATION: 335801080293201

MONITORING REQUIRED BY: NPDES Permit #SC 0024970, State of SC TAC Sup to AFM 85-14

DESCRIPTIVE PARAGRAPH: Site is located at the discharge weir of the chlorine contact chamber at the sewage treatment plant.

	1977 AVG	1978 AVG	1979 AVG	1980 AVG	1981 MONTHLY SAMPLES J	F	M	A	M	J	J	A	S	O	N	D	1981 AVG	77-81 AVG	STANDARD
Temperature (^{o}C)	20.3	21.1	20.0	22.3	16	21	20	23	24	27	24	26	26	20	-	17	22.18	21.176	None
pH	5.6	6.1	6.3	6.2	6.0	6.0	6.0	6.1	6.1	6.6	6.7	7.2	6.5	6.3	-	6.2	6.3	6.1	6.0-9.0
Dissolved Oxygen (mg/l)	8.2	7.8	7.7	7.3	8	7	8.1	9.3	7.6	8.5	8.8	9.8	9	9.3	-	9.2	8.5	7.90	5mg/1
COD (mg/1)	20.7	73.9	29	19.4	41	50	38	42	52	50	3.0	31	17	6	-	3	30.27	34.64	None
Oils and Greases (mg/1)	0.4	0.4	1.5	0.8	0.3	0.8	0.3	1.2	0.8	0.3	0.4	0.3	0.3	0.3	1.0	0.7	0.558	0.731	None
Nitrates (mg/1)	10.0	15.5	13.5	17.4	17	12.5	13.5	14.0	22.0	18.3	18.5	18.5	15.5	18.0	15.3	16.7	16.65	14.61	None
Phosphorus (mg/1)	5.7	6.1	6.9	8.5	8.5	6.9	8.2	7.0	12.5	7.4	6.0	7.5	7.8	8.2	8.1	6.8	7.90	7.02	None
Phenols (ug/1)	10	12	14	9.0	10	10	10	10	10	10	10	10	10	10	10	10	10	11.00	5ug/1
Suspended Solids (ppm)	4	4	12	7	14	15	11	15	12	14	8	15	4	1	-	2	10.9	7.418	23ppm

- SAMPLE NOT TAKEN
• SAMPLE LEAKED IN TRANSIT
• SAMPLE BROKEN IN TRANSIT

TABLE D.5

WASTEWATER TREATMENT PLANT SLUDGE

LEACHATE EXTRACTION TEST DATA

Parameter	Concentration
Arsenic	<0.2 mg/l
Barium	<10 mg/l
Cadmium	<0.1 mg/l
Chromium	<0.5 mg/l
Lead	<0.02 mg/l
Mercury	<0.02 mg/l
Selenium	<0.1 mg/l
Silver	<0.5 mg/l
Endrin	<0.002 mg/l
Lindane	<0.04 mg/l
Methoxychlor	<1.0 mg/l
Toxaphene	<0.05 mg/l
2,4-D	<1.0 mg/l
2,4,5-TP Silvex	<0.010 mg/l

Ignitability was greater than 60°C.

Source: Shaw AFB records.

TABLE D.6

SHAW AFB WATER QUALITY MONITORING DATA SUMMARY

SITE DESCRIPTION: Long Branch Creek above North Ditch
SITE LOCATION: 335920080275201
MONITORING REQUIRED BY: State of SC and Local Installation Policy
DESCRIPTIVE PARAGRAPH: Monitoring site is located on the east side of Frierson Road at the North edge of the base. This point is a sample of background stream before the base discharge into Long Branch Creek.

	1977 AVG	1978 AVG	1979 AVG	1980 AVG	1981 MONTHLY SAMPLES J	F	M	A	M	J	J	A	S	O	N	D	1981 AVG	77-81 AVG	STANDARD
Temperature (°C)	16	16	16	15.5	3	3.5	8.5	14	14	23	26	25	26	24	9	5.5	15.12	15.725	None
pH	6.7	6.1	5.9	6.3	-	6.5	7.2	6.8	6.8	6.8	7.2	7.0	7.2	7.0	7.0	6.5	6.33	6.26	6.0-8.5
Dissolved Oxygen (mg/l)	8.9	8.2	9.1	9	5.9	14.4	11.5	9.7	9.2	7.7	5.5	7.2	8.5	5.3	6.5	10.4	8.48	8.73	5mg/l
COD (mg/l)	17	21	22	12.8	10	10	10	10	15	20	10	16	17	15	13	10	13.00	17.16	None
Oil and Greases (mg/l)	0.5	0.4	0.3	0.2	0.3	0.3	0.3	0.3	*	0.4	0.3	0.3	0.4	0.4	0.3	0.3	0.3272	0.345	15mg/l
Nitrates	0.1	0.1	0.2	0.1	0.2	0.1	0.2	0.3	0.2	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.166	0.133	None
Phenols (ug/l)	10	98	10	10	10	10	10	10	10	10	10	*	10	10	10	10	10	27.6	1ug/l
Surfactants (mg/l)	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.12	None

- SAMPLE NOT TAKEN
+ SAMPLE LEAKED IN TRANSIT
* SAMPLE BROKEN IN TRANSIT

TABLE D.7

SHAW AFB WATER QUALITY MONITORING DATA SUMMARY

SITE DESCRIPTION: North Ditch
SITE LOCATION: 335920080275202
MONITORING REQUIRED BY: State of SC and Local Installation Policy
DESCRIPTIVE PARAGRAPH: Monitoring site is located on the east side of Frierson Road at north edge of base.

	1977 AVG	1978 AVG	1979 AVG	1980 AVG	1981 MONTHLY SAMPLES J	F	M	A	M	J	J	A	S	O	N	D	1981 AVG	77-81 AVG	STANDARD
Temperature (°C)	18	17	19	18.4	5	11	14	16	17	24	26	25	26	24	9	7	17	17.88	None
pH	6.3	6.3	6.6	6.4	7.2	7.4	7.2	7.4	6.8	7.2	7.0	7.2	7.2	6.8	7.5	7.5	7.2	6.56	6.0-8.5
Dissolved Oxygen (mg/l)	8.4	7.8	8.6	8.6	9.2	11.7	9.1	8.4	8.8	4.6	3.8	6.6	8.8	7.0	6.7	9.8	7.875	8.255	5mg/l
COD (mg/l)	9	17	16	15.6	10	10	10	10	10	50	10	13	15	15	+	39	17.45	15.01	None
Oil and Grease (mg/l)	0.5	0.7	0.3	0.7	0.3	0.3	0.8	0.6	*	0.8	0.6	0.5	0.6	5.5	0.5	0.1	0.595	0.883	15mg/l
Nitrates (mg/l)	0.2	0.4	0.5	0.6	1.0	1.0	0.9	1.0	0.7	0.7	0.4	0.6	0.6	0.3	0.2	0.2	0.633	.466	None
Phenols (ug/l)	15	149	10	10	10	10	90	10	10	20	10	10	10	10	-	10	16.666	40.133	1ug/l
Surfactants	0.3	0.1	0.1	0.175	0.1	0.1	0.1	0.1	0.1	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.146	0.158	None
Suspended Solids (ppm)	-	4.0	8.5	5.0	-	-	-	-	-	-	-	-	-	-	-	2.0	2.0	3.90	None

- SAMPLE NOT TAKEN
+ SAMPLE LEAKED IN TRANSIT
* SAMPLE BROKEN IN TRANSIT

TABLE D.8

SHAW AFB WATER QUALITY MONITORING DATA SUMMARY

SITE DESCRIPTION: Long Branch Creek Below North Ditch
SITE LOCATION: 335920080275203
MONITORING REQUIRED BY: State of SC and Local Installation Policy
DESCRIPTIVE PARAGRAPH: Monitoring site is located on the east side of Frierson Road at the North edge of the base. Sample of the stream after base discharge into Long Branch Creek.

	1977 AVG	1978 AVG	1979 AVG	1980 AVG	1981 MONTHLY SAMPLES J	F	M	A	M	J	J	A	S	O	N	D	1981 AVG	77-81 AVG	STANDARD
Temperature (°C)	17	17	17	16.7	5	4	12.5	16	16	24	25	25	26	23	8	6	15.875	16.715	None
pH	5.5	5.8	6.7	6.8	-	6.8	7.2	6.8	7.0	6.8	7.0	7.4	7.2	7.2	7.0	6.8	6.40	6.44	6.0-8.5
Dissolved **Oxygen (mg/1)**	8.6	8.2	8.9	9.6	7.2	14.5	10.0	9.5	10.0	4.6	7.0	6.2	8.7	6.8	8.7	11.5	8.725	8.805	5mg/1
COD (mg/1)	13.7	24.6	22	19	10	10	10	10	10	42	10	10	22	17	-	12	14.818	18.82	None
Oil and **Grease (mg/1)**	0.5	0.3	0.3	0.3	0.3	0.3	0.3	0.8	0.4	0.8	0.3	0.4	0.4	0.7	0.3	0.3	0.44	0.368	15mg/1
Nitrates (mg/1)	0.2	0.2	0.3	0.3	0.2	0.3	0.3	0.5	0.3	0.6	0.2	0.5	0.5	0.3	0.1	0.1	0.325	0.265	None
Phenols (ug/1)	13	11	10	87.2	10	10	20	10	10	16	10	10	10	10	10	-	11.50	26.34	1mg/1
Surfactants (mg/1)	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.4	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1333	0.146	None

- SAMPLE NOT TAKEN
• SAMPLE LEAKED IN TRANSIT
• SAMPLE BROKEN IN TRANSIT

TABLE D.9

SHAW AFB WATER QUALITY MONITORING DATA SUMMARY

SITE DESCRIPTION: Long Branch Creek Below Landfill
SITE LOCATION: 335911080271301
MONITORING REQUIRED BY: State of SC and Local Installation Policy
DESCRIPTIVE PARAGRAPH: Monitoring site is located at Long Branch Creek to the north and east of the sanitary landfill.

	1977 AVG	1978 AVG	1979 AVG	1980 AVG	1981 MONTHLY SAMPLES J	F	M	A	M	J	J	A	S	O	N	D	1981 AVG	77-81 AVG	STANDARD
Temperature (°C)	17	16	17	16.5	3	4.5	14	15	17	24	25	24.5	25	23	8	6	15.75	16.45	None
pH	6.3	6.1	6.3	6.4	7	6.8	6.8	6.8	7.0	6.8	6.9	7.0	6.8	7.2	7.0	6.5	6.8	6.39	6.0-8.5
Dissolved Oxygen (mg/l)	7.7	4.9	8.6	8.1	7.8	14.2	10	8.0	9.2	4.0	5.3	5.0	8.2	6.6	10.7	9.4	8.2	7.50	5mg/l
COD (mg/l)	16	38	19	15.3	10	10	10	10	12	20	10	10	14	10	14	16	12.16	20.09	None
Oil and Grease (mg/l)	0.4	0.3	0.3	0.36	0.3	0.3	0.3	0.6	0.3	0.5	0.3	0.4	0.6	0.3	0.8	0.3	0.416	0.255	15mg/l
Nitrates	0.1	0.1	0.2	0.3	0.4	0.3	0.3	0.1	0.3	0.1	0.2	0.3	0.6	0.2	0.3	0.1	0.267	0.193	None
Phenols	10	10	10	10	0.4	1.0	10	10	10	10	10	10	10	10	10	10	10.33	8.06	1ug/l
Surfactants (mg/l)	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.133	0.106	None

- SAMPLE NOT TAKEN
+ SAMPLE LEAKED IN TRANSIT
• SAMPLE BROKEN IN TRANSIT

TABLE D.10

SHAW AFB WATER QUALITY MONITORING DATA SUMMARY

SITE DESCRIPTION: Transportation Motor Pool
SITE LOCATION: 335807080292601
MONITORING REQUIRED BY: NPDES Permit #SC 0024970
DESCRIPTIVE PARAGRAPH: Monitoring site is located at storm discharge to the ditch at the main entrance to the motor pool.

	1977 AVG	1978 AVG	1979 AVG	1980 AVG	1981 MONTHLY SAMPLES J	F	M	A	M	J	J	A	S	O	N	D	1981 AVG	77-81 AVG	STANDARD
Temperature (°C)	22	19	22	25	-	-	-	-	-	25	-	-	-	-	-	-	25	22.6	None
pH	5.6	6.4	6.5	7.8	-	-	-	-	-	7.8	-	-	-	-	-	-	7.8	6.82	None
Oils and Greases (mg/l)	1.2	79	2.7	0.8	-	-	-	-	-	0.8	-	-	-	-	-	-	0.8	16.90	None

- SAMPLE NOT TAKEN
+ SAMPLE LEAKED IN TRANSIT
* SAMPLE BROKEN IN TRANSIT

TABLE D.11

SHAW AFB WATER QUALITY MONITORING DATA SUMMARY

SITE DESCRIPTION: South Ditch
SITE LOCATION: 335732080284401
MONITORING REQUIRED BY: NPDES Permit #SC 0024970
DESCRIPTIVE PARAGRAPH: Monitoring is located on the south side of the base between Perimeter Road and Highway 76.

	1977 AVG	1978 AVG	1979 AVG	1980 AVG	1981 MONTHLY SAMPLES J	F	M	A	M	J	J	A	S	O	N	D	1981 AVG	77-81 AVG	STANDARD
Temperature (°C)	19	19	20	22	-	-	-	-	-	-	-	-	-	-	-	-	-	20	None
pH	6.7	6.2	6.9	7.2	-	-	-	-	-	-	-	-	-	-	-	-	-	6.75	6.0-8.5
Dissolved Oxygen (mg/l)	4.8	5.9	8.2	6.8	-	-	-	-	-	-	-	-	-	-	-	-	-	6.42	5mg/l
COD (mg/l)	18	32	31	10	-	-	-	-	-	-	-	-	-	-	-	-	-	22.75	None
Oil and Grease (mg/l)	0.5	0.4	0.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.43	15mg/l
Phenols (ug/l)	10	10	10	10	-	-	-	-	-	-	-	-	-	-	-	-	-	10	1mg/l
Surfactants (mg/l)	0.4	0.2	0.2	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	0.22	None

- SAMPLE NOT TAKEN
+ SAMPLE LEAKED IN TRANSIT
* SAMPLE BROKEN IN TRANSIT

APPENDIX E

MASTER LIST OF INDUSTRIAL SHOPS

APPENDIX E

MASTER LIST OF SHOPS

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Typical T.S.D. Methods
363 Supply Squadron				
Quality Control Fuels Lab	112	Yes	No	---
363 Transportation Squadron				
Wheel/Tire/Battery Shop	325	Yes	Yes	Neutralized/ to San. Sewer
Refueling Maintenance Shop	118	Yes	Yes	DPDO
Welding Shop	325	Yes	No	---
Packing and Preservation Shop	200B	No	No	---
Paint Shop	325	Yes	No	---
363 Aircraft Generation Squadron				
17th AMU Weapons Shop	1605	No	No	---
17th AMU Sensors Shop	1605	No	No	---
363 Component Repair Squadron				
Electric Shop	1205	Yes	Yes	Neutralized/ to San. Sewer
Environmental Shop	1205	No	No	---

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Typical T.S.D. Methods
363 Component Repair Squadron (Continued)				
Pneudraulics Shop	1205	Yes	Yes	DPDO
Machine Shop	1205	No	No	---
Metal Processing/Welding Shop	1205	Yes	No	---
NDI Laboratory	1510	Yes	No	---
Structural Repair Shop	1200	Yes	No	---
Survival Equipment Shop	1213	Yes	No	---
Fabrication Shop	1213	Yes	No	---
Jet/Recip Engine Shop	1207	Yes	Yes	Oil/Water Separator
Test Cell	1708	Yes	Yes	Oil/Water Separator
PMEL Laboratory	826	Yes	No	---
F-16 Photo Shop	1207	No	No	---
Welding Shop	1205	Yes	No	---
363 Equipment Maintenance Squadron				
Aerospace Ground Equipment Shop	1602	Yes	Yes	DPDO
Wheel and Tire Shop	1200	Yes	Yes	DPDO
Fuel Shop	1511	Yes	No	---
Egress Shop	1205	Yes	Yes	DPDO
Repair and Reclamation Shop	1200	No	No	---
Munition Shop	1800	Yes	No	---

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Typical T.S.D. Methods
363 Equipment Maintenance Squadron (Continued)				
Corrosion Control	1511	Yes	Yes	DPDO/ San. Sewer
Hydrazine Facility	1619	Yes	No	---
Armament System Shop	1517	Yes	No	---
363 Tactical Fighter Wing				
Mobile Photo Lab	(Mobile; usually adjacent to Bldg. 706)	Yes	Yes	San. Sewer/ Silver Recovery to DPDO
USAF Hospital				
Dental X-ray Laboratory	1046	Yes	Yes	Silver Recovery to DPDO
Histopathology Lab	1048	Yes	Yes	DPDO
Medical X-ray Laboratory	1048	Yes	Yes	Silver Recovery to DPDO
Clinical Laboratory	1048	Yes	Yes	DPDO
363 Combat Support Group				
Base Photo Lab	404	Yes	Yes	San. Sewer/ Silver Recovery to DPDO
Firing Range	1846	Yes	Yes	DPDO
MWR Arts and Crafts	822	Yes	Yes	Silver Recovery to DPDO

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Typical T.S.D. Methods
363 Combat Support Group (Continued)				
Auto Hobby Shop	1031	Yes	Yes	DPDO
Aero Club	116	Yes	Yes	DPDO/Off-base Reuse
363 Civil Engineering Squadron				
Lawn Mower Repair Shop	220	Yes	No	---
Plumbing Shop	322	Yes	No	---
Liquid Fuels Maintenance	228	Yes	No	---
Heating Plant	403	Yes	Yes	Dilute to San. Sewer
Golf Course Maintenance	1417/1418	No	No	---
Electric Shop	318	No	No	---
Entomology Shop	315	Yes	Yes	San. Sewer
Water and Waste	310/306/600	Yes	No	---
Refrigeration Shop	323	Yes	No	---
Protective Coatings Shop	319	Yes	No	---
Power Production	313	Yes	Yes	Neutralized/ DPDO
Fire Extinguisher Shop	706	Yes	No	---
507 Tactical Air Control Center				
Corrosion Control	T-29	Yes	Yes	DPDO
AGE Maintenance	T-28	Yes	Yes	DPDO
Vehicle Maintenance	T-19	Yes	Yes	DPDO

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Typical T.S.D. Methods
21 Tactical Air Support Squadron				
Survival Equipment	620	No	No	---
682 Air Support/Operations Center Squadron				
AGE Maintenance	1852	Yes	Yes	DPDO
Vehicle Maintenance	1852	Yes	Yes	DPDO
4507 Consolidated Aircraft Maintenance Squadron				
Helicopter Maintenance	1211	Yes	Yes	DPDO
Fabrication/Corrosion Control	611	Yes	Yes	DPDO
AGE Shop	1212	Yes	Yes	DPDO

APPENDIX F

PHOTOGRAPHS

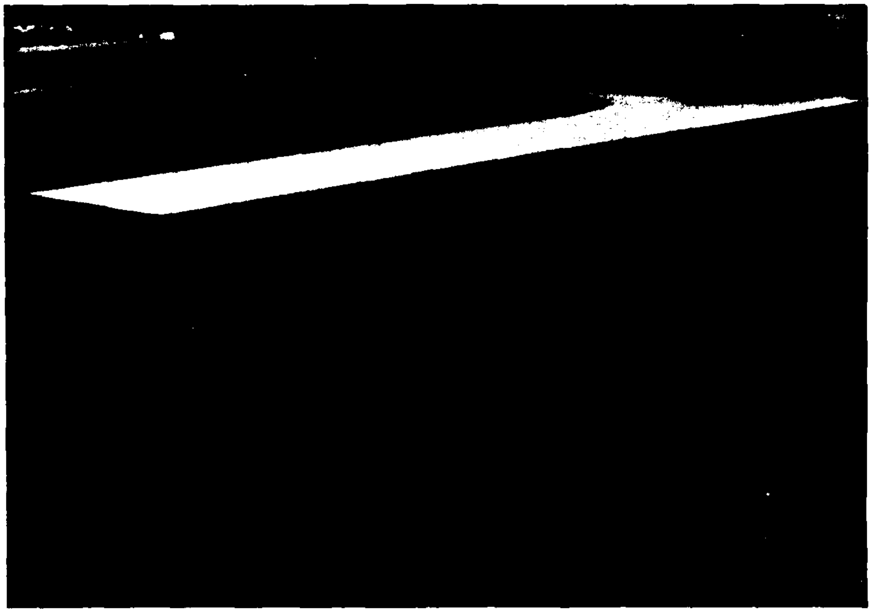

AFB

SHAW AFB

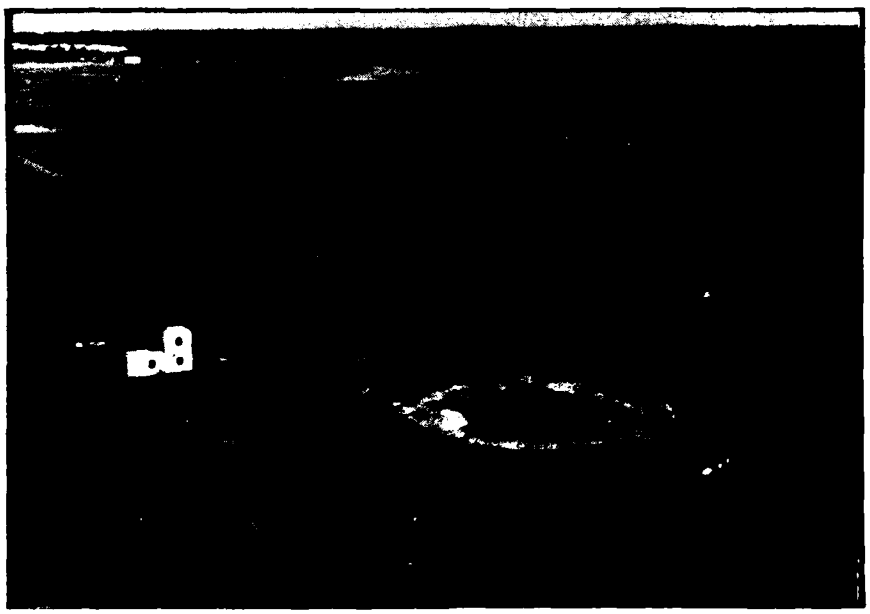
Landfill No. 1

Landfill No. 2

SHAW AFB

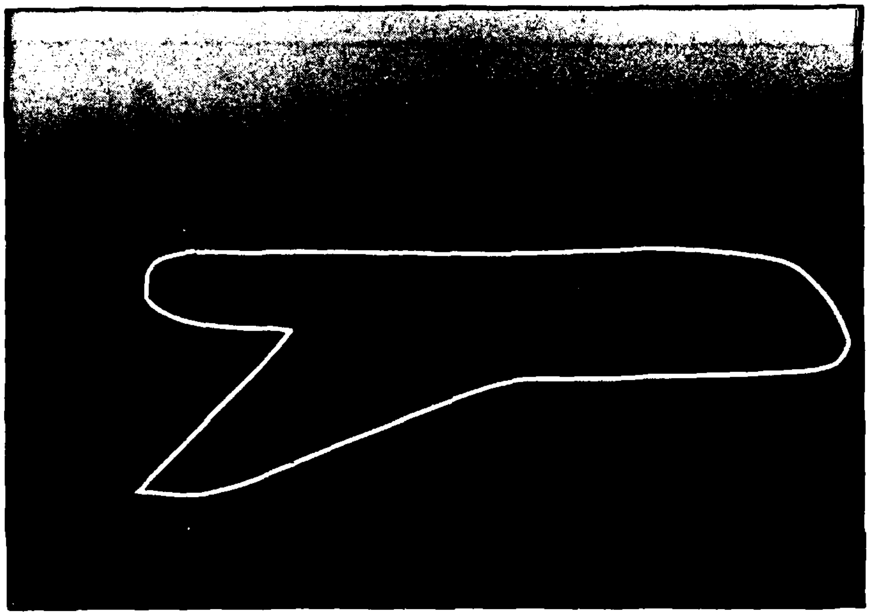


Fire Protection Training Area
No. 2



Fire Protection Training Area
No. 3

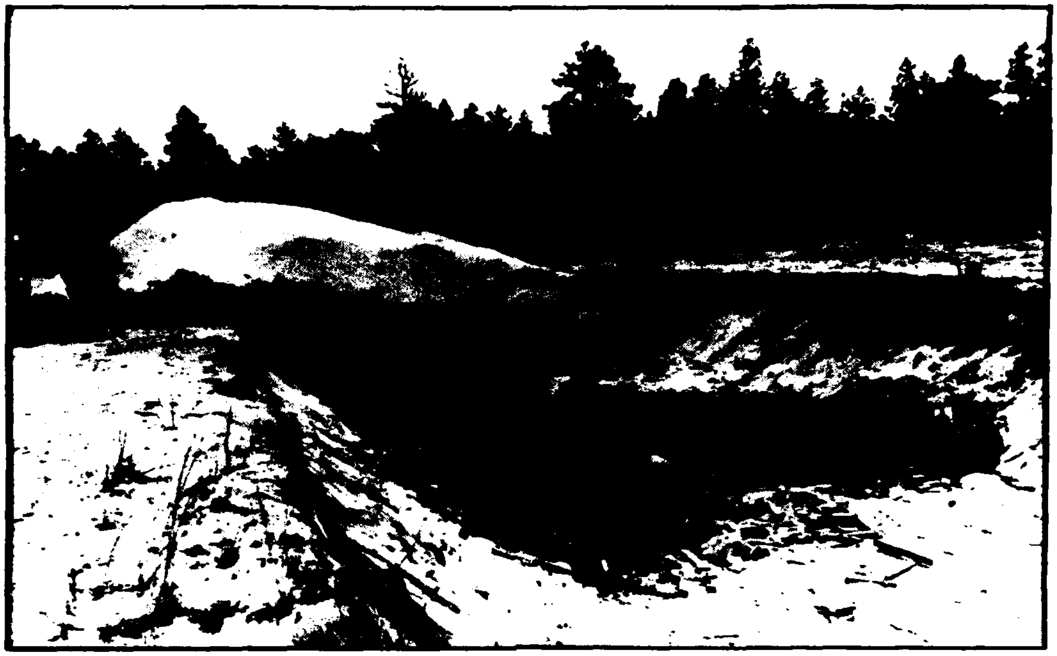
SHAW AFB

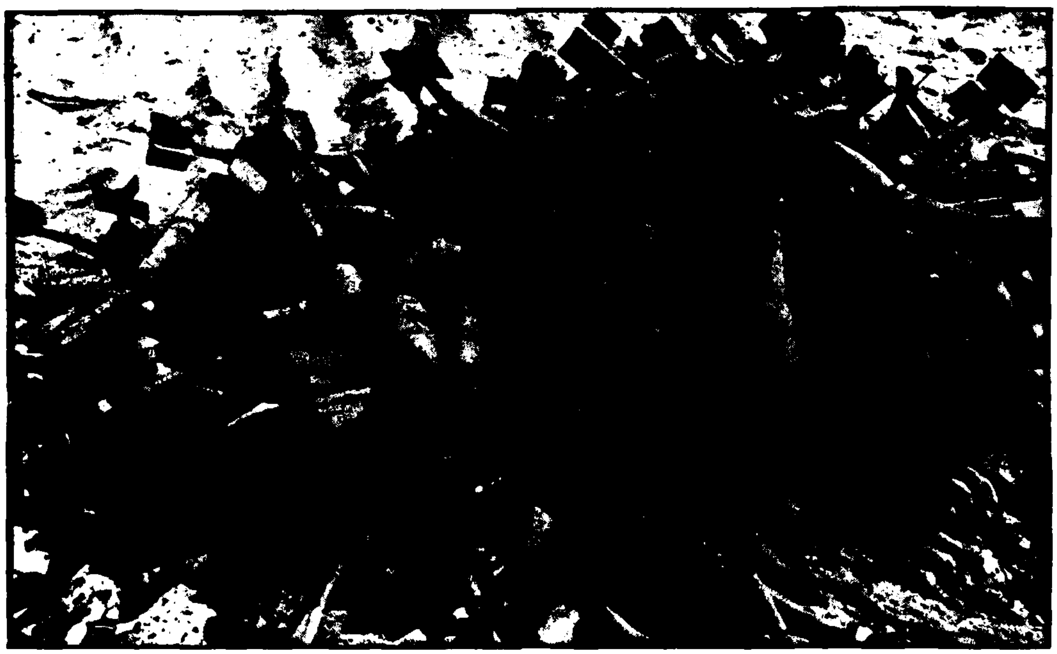


Landfill No. 3

Fire Protection Training Area
No. 1

POINSETT AIRCRAFT RANGE





Expended Ordnance Disposal Site

APPENDIX G

HAZARD ASSESSMENT RATING METHODOLOGY

APPENDIX G

USAF INSTALLATION RESTORATION PROGRAM

HAZARD ASSESSMENT RATING METHODOLOGY

BACKGROUND

The Department of Defense (DOD) has established a comprehensive program to identify, evaluate, and control problems associated with past disposal practices at DOD facilities. One of the actions required under this program is to:

> "develop and maintain a priority listing of contaminated installations and facilities for remedial action based on potential hazard to public health, welfare, and environmental impacts." (Reference: DEQPPM 81-5, 11 December 1981).

Accordingly, the United States Air Force (USAF) has sought to establish a system to set priorities for taking further actions at sites based upon information gathered during the Records Search phase of its Installation Restoration Program (IRP).

The first site rating model was developed in June 1981 at a meeting with representatives from USAF Occupational Environmental Health Laboratory (OEHL), Air Force Engineering Services Center (AFESC), Engineering-Science (ES) and CH_2M Hill. The basis for this model was a system developed for EPA by JRB Associates of McLean, Virginia. The JRB model was modified to meet Air Force needs.

After using this model for 6 months at over 20 Air Force installations, certain inadequacies became apparent. Therefore, on January 26 and 27, 1982, representatives of USAF OEHL, AFESC, various major commands, Engineering Science, and CH_2M Hill met to address the inadequacies. The result of the meeting was a new site rating model designed to present a better picture of the hazards posed by sites at Air Force installations. The new rating model described in this presentation is referred to as the Hazard Assessment Rating Methodology.

PURPOSE

The purpose of the site rating model is to provide a relative ranking of sites of suspected contamination from hazardous substances. This model will assist the Air Force in setting priorities for follow-on site investigations and confirmation work under Phase II of IRP.

This rating system is used only after it has been determined that (1) potential for contamination exists (hazardous wastes present in sufficient quantity), and (2) potential for migration exists. A site can be deleted from consideration for rating on either basis.

DESCRIPTION OF MODEL

Like the other hazardous waste site ranking models, the U.S. Air Force's site rating model uses a scoring system to rank sites for priority attention. However, in developing this model, the designers incorporated some special features to meet specific DOD program needs.

The model uses data readily obtained during the Record Search portion (Phase I) of the IRP. Scoring judgments and computations are easily made. In assessing the hazards at a given site, the model develops a score based on the most likely routes of contamination and the worst hazards at the site. Sites are given low scores only if there are clearly no hazards at the site. This approach meshes well with the policy for evaluating and setting restrictions on excess DOD properties.

As with the previous model, this model considers four aspects of the hazard posed by a specific site: the possible receptors of the contamination, the waste and its characteristics, potential pathways for waste contaminant migration, and any efforts to contain the contaminants. Each of these categories contains a number of rating factors that are used in the overall hazard rating.

The receptors category rating is calculated by scoring each factor, multiplying by a factor weighting constant and adding the weighted scores to obtain a total category score.

The pathways category rating is based on evidence of contaminant migration or an evaluation of the highest potential (worst case) for contaminant migration along one of three pathways. If evidence of contaminant migration exists, the category is given a subscore of 80 to 100 points. For indirect evidence, 80 points are assigned and for direct evidence 100 points are assigned. If no evidence is found, the highest score among three possible routes is used. These routes are surface water migration, flooding, and ground-water migration. Evaluation of each route involves factors associated with the particular migration route. The three pathways are evaluated and the highest score among all four of the potential scores is used.

The waste characteristics category is scored in three steps. First, a point rating is assigned based on an assessment of the waste quantity and the hazard (worst case) associated with the site. The level of confidence in the information is also factored into the assessment. Next, the score is multiplied by a waste persistence factor, which acts to reduce the score if the waste is not very persistent. Finally, the score is further modified by the physical state of the waste. Liquid wastes receive the maximum score, while scores for sludges and solids are reduced.

The scores for each of the three categories are then added together and normalized to a maximum possible score of 100. Then the waste management practice category is scored. Sites at which there is no containment are not reduced in score. Scores for sites with limited containment can be reduced by 5 percent. If a site is contained and well managed, its score can be reduced by 90 percent. The final site score is calculated by applying the waste management practices category factor to the sum of the scores for the other three categories.

FIGURE 1

HAZARD ASSESSMENT RATING METHODOLOGY FLOW CHART

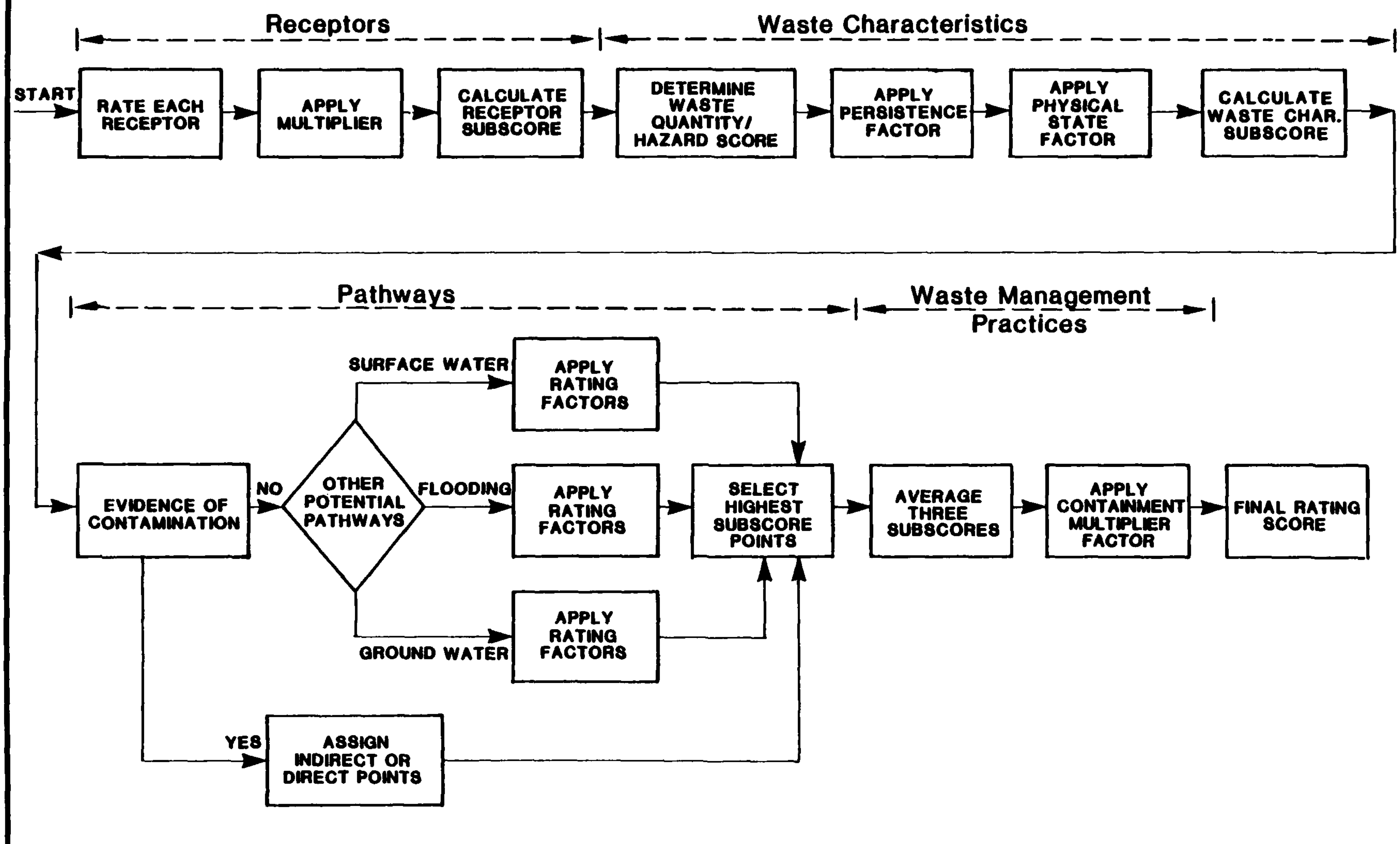


FIGURE 2

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE ______________________________

LOCATION ______________________________

DATE OF OPERATION OR OCCURRENCE ______________________________

OWNER/OPERATOR ______________________________

COMMENTS/DESCRIPTION ______________________________

SITE RATED BY ______________________________

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site		4		
B. Distance to nearest well		10		
C. Land use/zoning within 1 mile radius		3		
D. Distance to reservation boundary		6		
E. Critical environments within 1 mile radius of site		10		
F. Water quality of nearest surface water body		6		
G. Ground water use of uppermost aquifer		9		
H. Population served by surface water supply within 3 miles downstream of site		6		
I. Population served by ground-water supply within 3 miles of site		6		
		Subtotals	______	______

Receptors subscore (100 X factor score subtotal/maximum score subtotal) ______

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) ______
2. Confidence level (C = confirmed, S = suspected) ______
3. Hazard rating (H = high, M = medium, L = low) ______

Factor Subscore A (from 20 to 100 based on factor score matrix) ______

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

______ X ______ = ______

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

______ X ______ = ______

FIGURE 2 (Continued)

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		
Net precipitation		6		
Surface erosion		8		
Surface permeability		6		
Rainfall intensity		8		

Subtotals ______ ______

Subscore (100 X factor score subtotal/maximum score subtotal) ______

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 x factor score/3) ______

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water		8		
Net precipitation		6		
Soil permeability		8		
Subsurface flows		8		
Direct access to ground water		8		

Subtotals ______ ______

Subscore (100 x factor score subtotal/maximum score subtotal) ______

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore ______

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors ______
Waste Characteristics ______
Pathways ______

Total ______ divided by 3 = ______
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

______ X ______ = ______

TABLE 1

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

I. RECEPTORS CATEGORY

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
A. Population within 1,000 feet (includes on-base facilities)	0	1 - 25	26 - 100	Greater than 100	4
B. Distance to nearest water well	Greater than 3 miles	1 to 3 miles	3,001 feet to 1 mile	0 to 3,000 feet	10
C. Land Use/Zoning (within 1 mile radius)	Completely remote (zoning not applicable)	Agricultural	Commercial or industrial	Residential	3
D. Distance to installation boundary	Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	0 to 1,000 feet	6
E. Critical environments (within 1 mile radius)	Not a critical environment	Natural areas	Pristine natural areas; minor wetlands; preserved areas; presence of economically important natural resources susceptible to contamination.	Major habitat of an endangered or threatened species; presence of recharge area; major wetlands.	10
F. Water quality/use designation of nearest surface water body	Agricultural or industrial use.	Recreation, propagation and management of fish and wildlife.	Shellfish propagation and harvesting.	Potable water supplies	6
G. Ground-Water use of uppermost aquifer	Not used, other sources readily available.	Commercial, industrial, or irrigation, very limited other water sources.	Drinking water, municipal water available.	Drinking water, no municipal water available; commercial, industrial, or irrigation, no other water source available.	9
H. Population served by surface water supplies within 3 miles downstream of site	0	1 - 50	51 - 1,000	Greater than 1,000	6
I. Population served by aquifer supplies within 3 miles of site	0	1 - 50	51 - 1,000	Greater than 1, 000	6

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

II. WASTE CHARACTERISTICS

A-1 Hazardous Waste Quantity

S = Small quantity (<5 tons or 20 drums of liquid)
M = Moderate quantity (5 to 20 tons or 21 to 85 drums of liquid)
L = Large quantity (>20 tons or 85 drums of liquid)

A-2 Confidence Level of Information

C = Confirmed confidence level (minimum criteria below)

- o Verbal reports from interviewer (at least 2) or written information from the records.
- o Knowledge of types and quantities of wastes generated by shops and other areas on base.
- o Based on the above, a determination of the types and quantities of waste disposed of at the site.

S = Suspected confidence level

- o No verbal reports or conflicting verbal reports and no written information from the records.
- o Logic based on a knowledge of the types and quantities of hazardous wastes generated at the base, and a history of past waste disposal practices indicate that these wastes were disposed of at a site.

A-3 Hazard Rating

Hazard Category	Rating Scale Levels 0	1	2	3
Toxicity	Sax's Level 0	Sax's Level 1	Sax's Level 2	Sax's Level 3
Ignitability	Flash point greater than 200°F	Flash point at 140°F to 200°F	Flash point at 80°F to 140°F	Flash point less than 80°F
Radioactivity	At or below background levels	1 to 3 times background levels	3 to 5 times background levels	Over 5 times background levels

Use the highest individual rating based on toxicity, ignitability and radioactivity and determine the hazard rating.

Hazard Rating	Points
High (H)	3
Medium (M)	2
Low (L)	1

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

II. WASTE CHARACTERISTICS (Continued)

Waste Characteristics Matrix

Point Rating	Hazardous Waste Quantity	Confidence Level of Information	Hazard Rating
100	L	C	H
80	L	C	M
	M	C	H
70	L	S	H
60	S	C	H
	M	C	M
50	L	S	M
	L	C	L
	M	S	H
	S	C	M
40	S	S	H
	M	S	M
	M	C	L
	L	S	L
30	S	C	L
	M	S	L
	S	S	M
20	S	S	L

Notes:
For a site with more than one hazardous waste, the waste quantities may be added using the following rules:
Confidence Level
- o Confirmed confidence levels (C) can be added
- o Suspected confidence levels (S) can be added
- o Confirmed confidence levels cannot be added with suspected confidence levels

Waste Hazard Rating
- o Wastes with the same hazard rating can be added
- o Wastes with different hazard ratings can only be added in a downgrade mode, e.g., MCM + SCH = LCM if the total quantity is greater than 20 tons.

Example: Several wastes may be present at a site, each having an MCM designation (60 points). By adding the quantities of each waste, the designation may change to LCM (80 points). In this case, the correct point rating for the waste is 80.

B. Persistence Multiplier for Point Rating

Persistence Criteria	Multiply Point Rating From Part A by the Following
Metals, polycyclic compounds, and halogenated hydrocarbons	1.0
Substituted and other ring compounds	0.9
Straight chain hydrocarbons	0.8
Easily biodegradable compounds	0.4

C. Physical State Multiplier

Physical State	Multiply Point Total From Parts A and B by the Following
Liquid	1.0
Sludge	0.75
Solid	0.50

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

III. PATHWAYS CATEGORY

A. Evidence of Contamination

Direct evidence is obtained from laboratory analyses of hazardous contaminants present above natural background levels in surface water, ground water, or air. Evidence should confirm that the source of contamination is the site being evaluated.

Indirect evidence might be from visual observation (i.e., leachate), vegetation stress, sludge deposits, presence of taste and odors in drinking water, or reported discharges that cannot be directly confirmed as resulting from the site, but the site is greatly suspected of being a source of contamination.

Rating Factor	Rating Scale Levels 0	1	2	3	Multiplier
B-1 POTENTIAL FOR SURFACE WATER CONTAMINATION					
Distance to nearest surface water (includes drainage ditches and storm sewers)	Greater than 1 mile	2,001 feet to 1 mile	501 feet to 2,000 feet	0 to 500 feet	8
Net precipitation	Less than -10 in.	-10 to + 5 in.	+5 to +20 in.	Greater than +20 in.	6
Surface erosion	None	Slight	Moderate	Severe	8
Surface permeability	0% to 15% clay ($>10^{-2}$ cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	Greater than 50% clay ($<10^{-6}$ cm/sec)	6
Rainfall intensity based on 1 year 24-hr rainfall	<1.0 inch	1.0-2.0 inches	2.1-3.0 inches	>3.0 inches	8
B-2 POTENTIAL FOR FLOODING					
Floodplain	Beyond 100-year floodplain	In 25-year floodplain	In 10-year floodplain	Floods annually	1
B-3 POTENTIAL FOR GROUND-WATER CONTAMINATION					
Depth to ground water	Greater than 500 ft	50 to 500 feet	11 to 50 feet	0 to 10 feet	8
Net precipitation	Less than -10 in.	-10 to +5 in.	+5 to +20 in.	Greater than +20 in.	6
Soil permeability	Greater than 50% clay ($>10^{-6}$ cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	0% to 15% clay ($<10^{-2}$ cm/sec)	8
Subsurface flows	Bottom of site greater than 5 feet above high ground-water level	Bottom of site occasionally submerged	Bottom of site frequently submerged	Bottom of site located below mean ground-water level	8
Direct access to ground water (through faults, fractures, faulty well casings, subsidence fissures, etc.	No evidence of risk	Low risk	Moderate risk	High risk	8

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

IV. WASTE MANAGEMENT PRACTICES CATEGORY

.. This category adjusts the total risk as determined from the receptors, pathways, and waste characteristics categories for waste management practices and engineering controls designed to reduce this risk. The total risk is determined by first averaging the receptors, pathways, and waste characteristics subscores.

B. WASTE MANAGEMENT PRACTICES FACTOR

The following multipliers are then applied to the total risk points (from A):

Waste Management Practice	Multiplier
No containment	1.0
Limited containment	0.95
Fully contained and in full compliance	0.10

Guidelines for fully contained:

Landfills:

- o Clay cap or other impermeable cover
- o Leachate collection system
- o Liners in good condition
- o Adequate monitoring wells

Surface Impoundments:

- o Liners in good condition
- o Sound dikes and adequate freeboard
- o Adequate monitoring wells

Spills:

- o Quick spill cleanup action taken
- o Contaminated soil removed
- o Soil and/or water samples confirm total cleanup of the spill

Fire Proection Training Areas:

- o Concrete surface and berms
- o Oil/water separator for pretreatment of runoff
- o Effluent from oil/water separator to treatment plant

General Note: If data are not available or known to be complete the factor ratings under items I-A through I, III-B-1 or III-B-3, then leave blank for calculation of factor score and maximum possible score.

APPENDIX H

HAZARD ASSESSMENT RATING METHODOLOGY FORMS

HAZARD ASSESSMENT RATING METHODOLOGY FORMS

SHAW AIR FORCE BASE

TABLE OF CONTENTS

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Fire Protection Training Area No. 1

LOCATION Shaw AFB - northeast of ammo storage area

DATE OF OPERATION OR OCCURRENCE 1941-1969

OWNER/OPERATOR Shaw AFB

COMMENTS/DESCRIPTION Combustible wastes burned in area, drums and fuel tank sludge buried in area

SITE RATED BY E. Schroeder Mark Spiegel

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	2	10	20	30
C. Land use/zoning within 1 mile radius	1	3	3	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	1	6	6	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	102	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 57

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) M
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

80 x 1.0 = 80

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

80 x 1.0 = 80

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			68	108

Subscore (100 X factor score subtotal/maximum score subtotal) 63

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	2	8	16	24
Subtotals			54	114

Subscore (100 x factor score subtotal/maximum score subtotal) 47

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 63

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors 57
Waste Characteristics 80
Pathways 63

Total 200 divided by 3 = 67
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

67 x 1.0 = 67

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE CE Complex Storm Drainage Outfall

LOCATION Shaw AFB - near Bldgs. 308 and 315

DATE OF OPERATION OR OCCURRENCE 1941-1980

OWNER/OPERATOR Shaw AFB

COMMENTS/DESCRIPTION Pesticide rinsate discarded to storm drain

SITE RATED BY E J Schroeder Mark Sprengel

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	2	4	8	12
B. Distance to nearest well	2	10	20	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	1	6	6	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	109	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 61

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

40 x 1.0 = 40

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

40 x 1.0 = 40

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	-	8	-	-
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
		Subtotals	60	84

Subscore (100 X factor score subtotal/maximum score subtotal) 71

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	-	8	-	-
Direct access to ground water	3	8	24	24
		Subtotals	70	90

Subscore (100 x factor score subtotal/maximum score subtotal) 78

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 78

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	61
Waste Characteristics	40
Pathways	78

Total 179 divided by 3 = 60 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

60 x 1.0 = 60

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Landfill No. 3

LOCATION Shaw AFB - north end of main runway

DATE OF OPERATION OR OCCURRENCE 1945-1976

OWNER/OPERATOR Shaw AFB

COMMENTS/DESCRIPTION Closed landfill, partially covered with grass, some ponding on surface wastes burned until early 1960 s

SITE RATED BY E / Schroeder Mark Spiegel

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	1	3	3	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	1	6	6	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	112	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 62

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) M
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) M

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

40 x 1.0 = 40

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

40 x 1.0 = 40

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
		Subtotals	68	108

Subscore (100 X factor score subtotal/maximum score subtotal) 63

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	2	8	16	24
		Subtotals	54	114

Subscore (100 x factor score subtotal/maximum score subtotal) 47

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 63

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	62
Waste Characteristics	40
Pathways	63

Total 165 divided by 3 = 55 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

55 x 1.0 = 55

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE JP-4 Spill Site

LOCATION Shaw AFB - along Shaw Avenue, new fuel railhead

DATE OF OPERATION OR OCCURRENCE early 1970's

OWNER/OPERATOR Shaw AFB

COMMENTS/DESCRIPTION Quantity undetermined. Most fuel was washed into surface drainage system

SITE RATED BY E. J. Schroeder Mark Spriggs

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	1	6	6	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	117	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 65

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

60 x 0.8 = 48

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

48 x 1.0 = 48

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	2	8	16	24
Net precipitation	1	6	6	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
		Subtotals	52	108

Subscore (100 X factor score subtotal/maximum score subtotal) 48

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
		Subtotals	46	114

Subscore (100 x factor score subtotal/maximum score subtotal) 40

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 48

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	65
Waste Characteristics	48
Pathways	48

Total 161 divided by 3 = 54 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

54 x 1.0 = 54

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Fuel Tank Sludge Burial Site

LOCATION Shaw AFB - Southeast corner of bulk fuel storage area

DATE OF OPERATION OR OCCURRENCE 1960's

OWNER/OPERATOR Shaw AFB

COMMENTS/DESCRIPTION Area is presently undergoing disturbance due to drainage system modifications.

SITE RATED BY E J Schroeder   Mark Spruill

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	2	10	20	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	1	6	6	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	107	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 59

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) M

Factor Subscore A (from 20 to 100 based on factor score matrix) 50

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

50 x 1.0 = 50

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

50 x 0.75 = 38

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			68	108

Subscore (100 X factor score subtotal/maximum score subtotal) 63

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
Subtotals			46	114

Subscore (100 x factor score subtotal/maximum score subtotal) 40

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 63

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	59
Waste Characteristics	38
Pathways	63

Total 150 divided by 3 = 53 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

53 x 1.0 = 53

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Fire Protection Training Area No. 3

LOCATION Shaw AFB - East of main runway (open area)

DATE OF OPERATION OR OCCURRENCE 1981-present

OWNER/OPERATOR Shaw AFB

COMMENTS/DESCRIPTION Only JP-4 burned

SITE RATED BY E. J. Schroeder Mark Sprecht

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	2	10	20	30
C. Land use/zoning within 1 mile radius	1	3	3	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	1	6	6	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	92	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 51

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

60 x 1.0 = 60

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

60 x 1.0 = 60

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	2	8	16	24
Net precipitation	1	6	6	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	2	8	16	24
		Subtotals	44	108

Subscore (100 X factor score subtotal/maximum score subtotal) 41

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	2	8	16	24
		Subtotals	54	114

Subscore (100 x factor score subtotal/maximum score subtotal) 47

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 47

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	51
Waste Characteristics	60
Pathways	47
Total 158 divided by 3 =	53
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

53 x 0.95 = 50

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Fire Protection Training Area No. 2

LOCATION Shaw AFB - east of main runway (open area)

DATE OF OPERATION OR OCCURRENCE 1969-1981

OWNER/OPERATOR Shaw AFB

COMMENTS/DESCRIPTION Only JP-4 burned

SITE RATED BY E. J. Schroeder Mark Spiegel

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	2	10	20	30
C. Land use/zoning within 1 mile radius	1	3	3	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	1	6	6	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	92	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 51

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

60 x 0.8 = 48

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

48 x 1.0 = 48

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. *Select the highest rating,* and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	2	8	16	24
Net precipitation	1	6	6	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			52	108

Subscore (100 X factor score subtotal/maximum score subtotal) 48

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
Subtotals			46	114

Subscore (100 x factor score subtotal/maximum score subtotal) 40

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 48

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors 51
Waste Characteristics 48
Pathways 48

Total 147 divided by 3 = 49
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

49 x 1.0 = 49

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Landfill No. 2

LOCATION Shaw AFB - 200 feet south of firing in butt

DATE OF OPERATION OR OCCURRENCE 1945

OWNER/OPERATOR Shaw AFB

COMMENTS/DESCRIPTION Closed landfill, vegetative cover, wastes burned, trenches extended water table

SITE RATED BY E J Schroeder Mark Spiegel

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	2	10	20	30
C. Land use/zoning within 1 mile radius	1	3	3	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	1	6	6	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	102	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 57

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) L

Factor Subscore A (from 20 to 100 based on factor score matrix) 20

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

20 x 1.0 = 20

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

20 x 1.0 = 20

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
		Subtotals	68	108

Subscore (100 X factor score subtotal/maximum score subtotal) 63

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	3	8	24	24
Direct access to ground water	2	8	16	24
		Subtotals	78	114

Subscore (100 x factor score subtotal/maximum score subtotal) 68

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 68

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	57
Waste Characteristics	20
Pathways	68

Total 145 divided by 3 = 48 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

48 x 1.0 = 48

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Landfill No. 1

LOCATION Shaw AFB - Contractor Storage Area

DATE OF OPERATION OR OCCURRENCE 1941-1945

OWNER/OPERATOR Shaw AFB

COMMENTS/DESCRIPTION Closed landfill, sparse vegetation, wastes burned

SITE RATED BY E. J. Schroeder Mark Gregg

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	2	4	8	12
B. Distance to nearest well	2	10	20	30
C. Land use/zoning within 1 mile radius	1	3	3	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	1	6	6	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			106	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 59

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) L

Factor Subscore A (from 20 to 100 based on factor score matrix) 20

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

20 x 1.0 = 20

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

20 x 1.0 = 20

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
		Subtotals	68	108

Subscore (100 X factor score subtotal/maximum score subtotal) 63

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	1	8	8	24
Direct access to ground water	2	8	16	24
		Subtotals	70	114

Subscore (100 x factor score subtotal/maximum score subtotal) 61

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 63

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	59
Waste Characteristics	20
Pathways	63
Total 142 divided by 3 =	47 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

47 x 1.0 = 47

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Battery Acid Leak Area

LOCATION Shaw AFB - Motor pool area near Bldg. 327

DATE OF OPERATION OR OCCURRENCE Early 1970's

OWNER/OPERATOR Shaw AFB

COMMENTS/DESCRIPTION Acid leakage suspected due to the corrosion of an underground water pipe

SITE RATED BY E. Schroeder Mark Spiegel

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	2	4	8	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	1	6	6	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	119	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 66

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) M
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 50

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

50 x 0.4 = 20

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

20 x 1.0 = 20

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	2	8	16	24
Net precipitation	1	6	6	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
		Subtotals	52	108

Subscore (100 X factor score subtotal/maximum score subtotal) 48

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
		Subtotals	46	114

Subscore (100 x factor score subtotal/maximum score subtotal) 40

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 48

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	66
Waste Characteristics	20
Pathways	48

Total 134 divided by 3 = 45
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

45 x 1.0 = 45

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Inactive Coal Storage Area

LOCATION Shaw AFB - Southeast corner of base near ballfields

DATE OF OPERATION OR OCCURRENCE 1941-1969

OWNER/OPERATOR Shaw AFB

COMMENTS/DESCRIPTION Area has been cleaned. No coal residue is apparent

SITE RATED BY [illegible]

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	2	10	20	30
C. Land use/zoning within 1 mile radius	1	3	3	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	1	6	6	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	102	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 57

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) L

Factor Subscore A (from 20 to 100 based on factor score matrix) 30

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

30 x 1.0 = 30

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

30 x 1.0 = 30

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	2	8	16	24
Net precipitation	1	6	6	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			52	108

Subscore (100 X factor score subtotal/maximum score subtotal) 48

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
Subtotals			46	114

Subscore (100 x factor score subtotal/maximum score subtotal) 40

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 48

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	57
Waste Characteristics	30
Pathways	48
Total 135 divided by 3 =	45 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

45 x 0.95 = 43

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Sewage Treatment Plant Sludge Landfarm
LOCATION Shaw AFB - Pine plantation on southern border of base
DATE OF OPERATION OR OCCURRENCE 1976-present
OWNER/OPERATOR Shaw AFB
COMMENTS/DESCRIPTION RCRA EP Toxicity tests indicate sludge is not hazardous
SITE RATED BY [signatures]

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	1	3	3	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	1	6	6	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	112	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 62

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) L
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) L

Factor Subscore A (from 20 to 100 based on factor score matrix) 50

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

50 x 0.4 = 20

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

20 x 0.75 = 15

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	2	8	16	24
Net precipitation	1	6	6	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			52	108

Subscore (100 X factor score subtotal/maximum score subtotal) 48

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
Subtotals			46	114

Subscore (100 x factor score subtotal/maximum score subtotal) 40

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 48

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	62
Waste Characteristics	15
Pathways	48
Total 125 divided by 3 =	42 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

42 x 1.0 = $\boxed{42}$

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Expended Ordnance Disposal Area

LOCATION Poinsett Range

DATE OF OPERATION OR OCCURRENCE 1951-present

OWNER/OPERATOR Shaw AFB

COMMENTS/DESCRIPTION All ordnance burned and verified non-explosive--concern for metals in leachate

SITE RATED BY E J Schroeder Mark E Hapsley

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	2	10	20	30
C. Land use/zoning within 1 mile radius	0	3	0	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	1	6	6	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			89	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 49

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) L

Factor Subscore A (from 20 to 100 based on factor score matrix) 30

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

30 x 1.0 = 30

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

30 x 0.5 = 15

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	2	8	16	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
		Subtotals	60	108

Subscore (100 X factor score subtotal/maximum score subtotal) 56

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
		Subtotals	46	114

Subscore (100 x factor score subtotal/maximum score subtotal) 40

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 56

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors 49
Waste Characteristics 15
Pathways 56

Total 120 divided by 3 = 40
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

40 x 1.0 = 40

APPENDIX I

REFERENCES

APPENDIX I

REFERENCES

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APPENDIX J

GLOSSARY OF TERMINOLOGY AND ABBREVIATIONS

APPENDIX J

GLOSSARY OF TERMINOLOGY AND ABBREVIATIONS

ACFT MAINT: Aircraft Maintenance

AF: Air Force

AFB: Air Force Base

AFCS: Air Force Communications Service

AFESC: Air Force Engineering and Services Center

AFFF: Aqueous Film Forming Foam, a fire extinguishing agent

AFR: Air Force Regulation

AFS: Air Force Station

AFSC: Air Force Systems Command

Ag: Chemical symbol for silver

AGS: Aircraft Generation Squadron

Al: Chemical symbol for aluminum

ANG: Air National Guard

ARTESIAN: Ground water contained under hydrostatic pressure

AQUICLUDE: Poorly permeable formation that impedes ground-water movement and does not yield to a well or spring

AQUIFER: a geologic formation, group of formations, or part of a formation that is capable of yielding water to a well or spring

AQUITARD: A geologic unit which impedes ground-water flow

AVGAS: Aviation Gasoline

Ba: Chemical symbol for barium

BES: Bioenvironmental Engineering Services

BIOACCUMULATE: Tendency of elements or compounds to accumulate or build up in the tissues of living organisms when they are exposed to these elements in their environments, e.g., heavy metals

CAMS: Consolidated Aircraft Maintenance Squadron

Cd: Chemical symbol for cadmium

CERCLA: Comprehensive Environmental Response, Compensation and Liability Act

CES: Civil Engineering Squadron

CIRCA: About; used to indicate an approximate date

Class B Water: Water suitable for secondary contact as in recreation, as a source for drinking water supply after conventional treatment in accordance with the regulations of the SCDHEC, for fishing, for survival and propogation of fish and other flora and fauna, and for industrial and agricultural use.

CLOSURE: The completion of a set of rigidly defined functions for a hazardous waste facility no longer in operation

CN: Chemical symbol for cyanide

COASTAL PLAINS: Physiographic province of the Eastern United States characterized by a gently seaward sloping surface formed over exposed, unconsolidated, stratified marine fluvial sediments. Typical coastal plain features include low hills and ridges, organic deposits, floodplains and high water tables

COD: Chemical Oxygen Demand, a measure of the amount of oxygen required to oxidize organic and oxidizable inorganic compounds in water

COE: Corps of Engineers

CONFINED AQUIFER: An aquifer bounded above and below by impermeable strata or by geologic units of distinctly lower permeability than that of the aquifer itself

CONTAMINATION: The degradation of natural water quality to the extent that its usefulness is impaired; there is no implication of any specific limits since the degree of permissible contamination depends upon the intended end use or uses of the water

Cr: Chemical symbol for chromium

CRS: Component Repair Squadron

CSG: Combat Support Group

Cu: Chemical symbol for copper

DET: Detachment

DISPOSAL FACILITY: A facility or part of a facility at which hazardous waste is intentionally placed into or on land or water, and at which waste will remain after closure

DISPOSAL OF HAZARDOUS WASTE: The discharge, deposit, injection, dumping, spilling, or placing of any hazardous waste into or on land or water so that such waste or any constituent thereof may enter the environment or be emitted into the air or discharged into any waters, including ground water

DOD: Department of Defense

DOWNGRADIENT: In the direction of lower hydraulic static head; the direction in which ground water typically flows

DPDO: Defense Property Disposal Office, formerly Redistribution and Marketing

DUMP: An uncovered land disposal site where solid and/or liquid wastes are deposited with little or no regard for pollution control or aesthetics; dumps are susceptible to open burning and are exposed to the elements, disease, vectors and scavengers

EFFLUENT: A liquid waste discharge from a manufacturing or treatment process, in its natural state, or partially or completely treated, that discharges into the environment

EMS: Equipment Maintenance Squadron

ENT: Ear, Nose and Throat, an area of medical specialization

EOD: Explosive Ordnance Disposal

EP: Extraction procedure, the EPA's standard laboratory procedure for leachate generation

EPA: Environmental Protection Agency

EPHEMERAL AQUIFER: A water-bearing zone typically located near the surface which normally contains water seasonally

EROSION: The wearing away of land surface by wind, water or chemical processes

FAA: Federal Aviation Administration

FACILITY: Any land and appurtenances thereon and thereto used for the treatment, storage and/or disposal of hazardous wastes

Fe: Chemical symbol for iron

FLOOD PLAIN: The lowland and relatively flat areas adjoining inland and coastal areas of the mainland and off-shore islands, including, at a minimum, areas subject to a one percent or greater chance of flooding in any given year

FLOW PATH: The direction or movement of ground water as governed principally by the hydraulic gradient

FPTA: Fire Protection Training Area

GC/MS: Gas chromatograph/mass spectrophotometer, a laboratory procedure for identifying unknown compounds

GROUND WATER: Water beneath the land surface in the saturated zone that is under atmospheric or artesian pressure

GROUND-WATER RESERVOIR: The earth materials and the intervening open spaces that contain ground water

HARDFILL: Disposal sites receiving construction debris, wood, miscellaneous spoil material

HARM: Hazardous Assessment Rating Methodology

HAZARDOUS WASTE: As defined in RCRA, a solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical or infectious characteristics may cause or significantly contribute to an increase in mortality or an increase in serious, irreversible, or incapacitating reversible illness; or pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed. The South Carolina Hazardous Waste Management Act uses this definition, but also defines waste oils as hazardous wastes.

HAZARDOUS WASTE GENERATION: The act or process of producing a hazardous waste

HEAVY METALS: Metallic elements, including the transition series, which include many elements required for plant and animal nutrition in trace concentrations but which become toxic at higher concentrations

Hg: Chemical symbol for mercury

HQ: Headquarters

HWMF: Hazardous Waste Management Facility

INCOMPATIBLE WASTE: A waste unsuitable for commingling with another waste or material because the commingling might result in generation of extreme heat or pressure, explosion or violent reaction, fire, formation of substances which are shock sensitive, friction sensitive, or otherwise have the potential for reacting violently, formation of toxic dusts, mists, fumes, and gases, volatilization of ignitable or toxic chemicals due to heat generation in such a manner that the likelihood of contamination of ground water or escape of the substance into the environment is increased, any other reaction which might result in not meeting the air, human health, and environmental standards.

INFILTRATION: The movement of water through the soil surface into the ground

IRP: Installation Restoration Program

ISOPACH: Graphic presentation of geologic data, including lines of equal unit thickness that may be based on confirmed (drill hole) data or indirect geophysical measurement.

JP-4: Jet Propulsion Fuel Number Four

LEACHATE: A solution resulting from the separation or dissolving of soluble or particulate constituents from solid waste or other man-placed medium by percolation of water

LEACHING: The process by which soluble materials in the soil, such as nutrients, pesticide chemicals or contaminants, are washed into a lower layer of soil or are dissolved and carried away by water

LINER: A continuous layer of natural or man-made materials beneath or on the sides of a surface impoundment, landfill, or landfill cell which restricts the downward or lateral escape of hazardous waste, hazardous waste constituents or leachate

LYSIMETER: A vacuum operated sampling device used for extracting pore water samples at various depths within the unsaturated zone

MAC: Military Airlift Command

MEK: Methyl Ethyl Ketone

MDG: Million gallons per day

MOGAS: Motor gasoline

Mn: Chemical symbol for manganese

MONITORING WELL: A well used to measure ground-water levels and to obtain water-quality samples

MSL: Mean Sea Level

NCO: Non-commissioned Officer

NCOIC: Non-commissioned Officer In-Charge

NDI: Non-destructive inspection

NGVD: National Geodetic Vertical Datum of 1929

Ni: Chemical symbol for nickel

NPDES: National Pollutant Discharge Elimination System

OEHL: Occupational and Environmental Health Laboratory

OPNS: Operations

ORGANIC: Being, containing or relating to carbon compounds, especially in which hydrogen is attached to carbon

OSI: Office of Special Investigations

O&G: Symbols for oil and grease

Pb: Chemical symbol for lead

PCB: Polychlorinated Biphenyl; liquids used as dielectrics in electrical equipment

PERCOLATION: Movement of moisture by gravity or hydrostatic pressure through interstices of unsaturated rock or soil

PERMEABILITY: The capacity of a porous rock, soil or sediment for transmitting a fluid without damage to the structure of the medium

PD-680: Cleaning solvent

pH: Negative logarithm of hydrogen ion concentration

PL: Public Law

POL: Petroleum, Oils and Lubricants

POLLUTANT: Any introduced gas, liquid or solid that makes a resource unfit for a specific purpose

PPB: Parts per billion by weight

PPM: Parts per million by weight

RCRA: Resource Conservation and Recovery Act

RECHARGE AREA: A surface area in which surface water or precipitation percolates through the unsaturated zone and eventually reaches the zone of saturation. Recharge areas may be natural or manmade

RECHARGE: The addition of water to the ground-water system by natural or artificial processes

SAFB: Shaw Air Force Base

SANITARY LANDFILL: A land disposal site using an engineered method of disposing solid wastes on land in a way that minimizes environmental hazards

SATURATED ZONE: That part of the earth's crust in which all voids are filled with water

SCDHEC: South Carolina Department of Health and Environmental Control

SCS: U.S. Department of Agriculture Soil Conservation Service

SLUDGE: Any garbage, refuse, or sludge from a waste treatment plant, water supply treatment, or air pollution control facility and other discarded material, including solid, liquid, semi-solid, or contained gaseous material resulting from industrial, commercial, mining, or agricultural operations and from community activities, but does not include solid or dissolved materials in domestic sewage; solid or dissolved materials in irrigation return flows; industrial discharges which are point source subject to permits under Section 402 of the Federal Water Pollution Control Act, as amended (86 USC 880); or source, special nuclear, or by-product material as defined by the Atomic Energy Act of 1954 (68 USC 923)

SPILL: Any unplanned release or discharge of a hazardous waste onto or into the air, land, or water

SS: Supply Squadron

STORAGE OF HAZARDOUS WASTE: Containment, either on a temporary basis or for a period of years, in such a manner as not to constitute disposal of such hazardous waste

STP: Sewage Treatment Plant

TAC: Tactical Air Command

TACC: Tactical Air Control Center

TASS: Tactical Air Support Squadron

TFW: Tactical Fighter Wing

TOXICITY: The ability of a material to produce injury or disease upon exposure, ingestion, inhalation, or assimilation by a living organism

TRANSMISSIVITY: The rate at which water is transmitted through a unit width of aquifer under a unit hydraulic gradient

TREATMENT OF HAZARDOUS WASTE: Any method, technique, or process including neutralization designed to change the physical, chemical, or biological character or composition of any hazardous waste so as to neutralize the waste or so as to render the waste nonhazardous

TSD: Treatment, storage or disposal

UPGRADIENT: In the direction of increasing hydraulic static head; the direction opposite to the prevailing flow of ground water

USAF: United States Air Force

USAFSS: United States Air Force Security Service

USGS: United States Geological Survey

USMC: United States Marine Corps

USN: United States Navy

WATER TABLE: Surface of a body of unconfined ground water at which the pressure is equal to that of the atmosphere

Zn: Chemical symbol for zinc

APPENDIX K

INDEX OF REFERENCES TO POTENTIAL CONTAMINATION SOURCES

APPENDIX K

INDEX OF REFERENCES TO POTENTIAL CONTAMINATION SOURCES